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CONTENTS

ILLUSTRATED:

The Mississippi River Bridge at Thebes.....	20
Tandem Compound Consolidation Locomotive for the Cape Government Railroads, South Africa.....	23
Requirements of Machine Tool Operation with Special Reference to Motor Drive.....	24
New Car Shops of the Lackawanna at Scranton, Pa.....	26
Graphic Record of Track Inspection.....	29

EDITORIAL

Friction Draft Gear.....	30
One Way to Cure the Trusts.....	30
An Extraordinary Engineering Contract.....	31
Annual Report—Southern Pacific Co.....	31
Editorial Notes.....	30, 32

MISCELLANEOUS:

The Training of the Engineer.....	19
Retrospect and Prospect: Views of Railroad Presi- dents.....	19
Large Steamships Now Building in American Yards.....	26
The Steel Corporation's Plan for Partnership and Profit-Sharing.....	26
Foreign Railroad Notes.....	27
Ton-Mile Statistics.....	28
Mr. Hines on Government Regulation of Railroad Rates.....	28
The Association of Motive Power Officers of the Van- derbilt Lines.....	32
City Transportation in Chicago.....	32
Improvements on the Central Pacific.....	33
The Taff Vale Strike Verdict.....	33
Wages.....	33

GENERAL NEWS:

Technical.....	33
The Scrap Heap.....	34
Locomotive Building.....	35
Car Building.....	35
Bridge Building.....	35
Meetings and Announcements.....	36
Personal.....	36
Elections and Appointments.....	37
Railroad Construction.....	37
General Railroad News.....	38

The Training of the Engineer.

A week or two ago we printed a short extract from an address delivered by Professor Goss before the St. Louis Railway Club, describing the training of the engineer students in a modern school. Below will be found a long extract from the paper, giving a description of the engineering courses in some detail. Professor Goss's address was illustrated by lantern slides, which fact accounts for some of the phraseology. We have not changed this, although we do not reproduce the pictures.

All through the college course, there runs a line of so-called "general-culture studies." In a technical school, these are frequently conducted in a manner which gives them technical significance, but however administered, they are invaluable to the student-engineer who in his desire to become a man among men is in need of their broadening influence. He works in literature and in history. Political economy reveals to him the fundamental principles underlying and regulating production and trade, and French or German, or both, engage his attention not as accomplishments but as a means of access to foreign technical literature, for while the world, in a material sense is vast, and no one aspires to familiarize himself with the physical characteristics of every part, the world of scientific achievement is comparatively limited, and the progressive engineer cannot afford to have the results of the great laboratories of Europe closed against him.

He finds the subject of physics administered with a rigor which makes all but the strongest quail. It is, in fact, the first really scientific subject which he comes upon in his course, and as he is not yet expert in grasping new scientific conceptions, there are difficulties to be overcome. But he listens to the truth as defined by an enthusiastic lecturer; he searches the pages of his text, and is attentive to the fascinating experimental demonstrations of the class room. In this way he apprehends the facts. But to clinch them, to make them his own, he passes on to the physical laboratory, where by the use of appropriate apparatus, he performs experiments which still further demonstrate their truth.

In a similar manner he seeks to disentangle the profound mysteries of chemistry, which touches the life of all people in this modern world of ours, at more points than any other single science, for chemistry not only directs the pharmacist and physician in their work, but manufacturers of every sort. As the engineer has much in common with the chemist, the student-engineer, after listening to lectures and witnessing brilliant demonstrations, goes to the chemical laboratory where he himself becomes, for a time, a chemist.

But of all the general studies none is so important to the student-engineer as mathematics. Algebra ceases to be discipline, because its value as a means of solution is quickly appreciated. Trigonometry by revealing the fascinating principles of measurement by angles, stimulates his fancy. Analytical geometry and the calculus are soon passed, for to the student engineer, these are but the gateway to the great subject of mechanics which he is anxious to enter, that he may see developed by mathematical processes, and defined by mathematical formulae, the principles by which the strength and stability of every engineering structure are determined.

This is all serious business and as we have not yet followed our student-engineer at his severely technical work, a hasty consideration might lead one to conclude that his shoulders will not be broad enough for his burden. But there are counter-forces in action. These develop him in other directions. In all of the so-called Land Grant Colleges, which embrace a large majority of American schools of engineering, every student is given regular practice in military drill during some portion of his college course. He drills in

squads and in companies, while professors and those students who have served their time look on. This holds his shoulders up and makes him prompt to respond to command. He also finds time for relaxation in the gymnasium and it is not unlikely that he may expand his lungs by a little play at football.

But during all this time there is technical work in progress. It begins in fact on the very first day of the Freshman year, and it does not cease until the commencement platform is reached. As it is the province of the full-fledged engineer to deal with the "forces and materials of nature," so it is the purpose of the student of engineering to become familiar with the characteristic physical properties of the common constructive materials, and with processes by which these materials are worked into useful shapes. We now see him engaged with this very problem. He is in the woodworking room where, with the tools of a carpenter, he is taught to saw and to plane, to mortise and to splice, to glue and to nail, until he acquires a fairly good understanding of the fundamental principles which go far to make up the joiner's art. Then he goes to woodworking machines and he soon produces turned articles of beautiful outline and finish. Pattern-making follows as the rounding out of the woodworking courses, and it is but a short step from the pattern-making to the work of the foundry, for it is here that the pattern is made to serve the purpose for which it was designed. When, by the progress of his work, the floor of the foundry becomes filled with finished molds, the cupola furnace is charged, the blast turned on, the furnace tapped, ladles filled, the mold poured, and the day's harvest of finished castings is gathered from out the steaming sand. Following the work of the foundry is that of the forge room, where our future engineer is taught to manage a smith's fire, and to heat iron for forging, to draw and upset, to weld, anneal, case-harden and temper; and in a surprisingly short time he finishes his work at the forge and goes to the machine room.

By this round of shops, involving a total in most institutions of scarcely more than 600 hours' practice, our student-engineer has been made acquainted with the various processes through which all machine construction must pass.

But some may object. They may say that this shop work involves dust and dirt, and oily hands and overalls, to all of which I agree. Our student-engineer sees nothing objectionable in these. Engineers frequently produce great things even from dust. To him oil is not offensive matter, but a means of lubrication. The cuttings which slowly accumulate under his machine are not litter—not common dirt to him—for in them he sees the degree of efficiency which marks the cutting action of the tool that removes them. So even the dust of the floor is full of meaning. And, moreover, all is but a means to an end, and his ambition is fixed upon the end.

During the early portion of the course when shop work is in progress, our student-engineer is introduced to the intricacies of mechanical drawing. He is given practice in making lines and letters until he can make them well, and later he produces working drawings for use in the shops. This early work is a part of his preparation for the more exacting courses in engineering design which are to follow.

Up to this point in their course, all our student-engineers have worked side by side on the same subjects regardless of what may be the particular phase of engineering construction or research upon which they intend to enter. Every student in engineering in fact has an interest in, and depends for his success upon, all the lines of instruction which have thus far been described, but with the close of the shop courses, which ordinarily is at the end of his second year, there is a change. At this time each man turns to his advanced technical instruction as to a definite objective point. For example, the civil engineer enters upon practice in the field. The electrical engineer studies dynamos, lights and problems in current transmission, while the mechanical engineer becomes chiefly interested in steam engineering, hydraulics, the strength of materials and railway equipment. It is obviously impossible for the individual in whose pathway we follow to take in four years every branch of engineering work. We shall assume, therefore, that he has long since elected to become a mechanical engineer, and shall observe his progress in meeting the requirements of such a course.

His early work as an advanced student in mechanical engineering involves a study of mechanism in the course of which such elementary forms as gears, cams and various sorts of link-work which are commonly employed to transmit or to modify motion are dealt with. This is the foundation for his work in machine designs. He studies metallurgy to become familiar with the processes by which metals are refined. He is concerned, also, with problems in power transmission by means of belts, and ropes, and gears, and shafting, and is given practice in designing power-distributing plants for factories and mills.

The student of mechanical engineering has large interest also in all those studies which concern the strength of the materials used in construction. Reference has already been made to the mathematical processes of this work whereby proposed structures are analyzed for the purpose of determining the stress to which their several members are to be subjected. Another phase of the subject is studied experimentally in the laboratory where, with machines of enormous capacity, pieces of material are subjected to stress and their behavior and ultimate resistance thus determined.

In the routine of the laboratory pieces of material are assigned to students who, after testing them, file a complete report, presenting the facts concerning the physical properties of the material tested and an opinion concerning its value, after the manner of an expert. Here is a railroad car axle fixed in the testing machine by student experts and now awaiting their return. This axle is undergoing a systematic examination, while under stress.

Any one who sets out to study machines, or the means for setting them in motion, is very soon attracted by the power developed by running water. The student of engineering, therefore, must master hydraulics. In this study he deals with problems affecting the flow of water in pipes, through orifices, and over weirs; with the efficiency of pumps and pumping engines, and with the performance of water wheels and motors.

But the one great subject which most interests the mechanical student is that of steam engineering. He goes deep into thermodynamics, a subject dealing with all the processes having for their purpose the conversion of heat into work. He studies the mechanism of engines and the construction of boilers, he follows the theories which concern their action,

he gives a large amount of time to testing their performance, and he tries his ingenuity in the elaboration of original designs.

Attending our student, with some degree of deliberation, through this branch of his work, we find him as a junior engaged in a study of valve gears and other elements entering into the mechanism of engines. He is required to see valves, and afterwards take indicator cards which are to prove that he has accomplished what he was set to do. Later he assists at engine testing and, finally, he himself is made responsible for a series of tests which are planned to establish some specific fact concerning the performance of a given engine.

When the processes of the laboratory have yielded him their data he summarizes, and compares, and analyzes, and finally draws conclusions such as may seem to him to be justified, and these constitute the final result of his work. He thus becomes engaged in work of scientific research and his results are oftentimes genuine additions to the sum of valuable knowledge. He must deal not with one engine merely, but with those having plain slide valves, and with others which have automatic cut-offs, with the high speed engine and with the engine of low speed, with engines exhausting into the atmosphere, and with engines exhausting into a condenser, with simple, with compound and even with triple-expansion engines, with engines designed to drive machinery and with engines designed to operate pumps, with engines that are stationary, and with locomotive engines. By means such as these he becomes familiar with the mechanism and the performance of the various common types of steam engine.

Enough has already been said to show that the work of the Mechanical Engineer, when made comprehensive, touches at many points the activity of the railroads. The time is not sufficient for even the briefest review of his work in car design, in train resistance and in railroad signals, but we may give a moment to his laboratory work in locomotive testing. Every man is assigned his place. Some are stationed by the cylinders (Fig. 11) and by means of indicators, measure the power which the steam develops upon the piston. Others observe the dynamometer which indicates the force with which the engine pulls ahead. Another attends to the apparatus which records the speed. One determines the quality of the steam in the boiler. Another notes the variation in steam pressure. Another determines the temperature of the waste gases passing up the stack. Others weigh the feed water as it is delivered to the boiler, and still another group determines the weight of coal required to evaporate the water thus delivered.

But the engine waits. The student-engineer pulls the throttle, the wheels turn, and for hours they will neither slacken nor cease. A gong sounds the time at five-minute intervals, and upon its stroke each student takes the observation which is assigned to him. The effect of this process upon a poet's mind has given rise to the following offering:

"There's something weird in those swift wheels that go,
Yet never come to station or depot;
The whistle toots, yet at no iron wicket,
Doth any man demand to punch a ticket;
The smoke ascends, but from the empty cab
No anxious engineer leans forth to grab
His written orders; always in the house
The grim cow-catcher never catches cows."

But the time comes when the last gong of the test is struck and the throttle is closed, the wheels slacken, the din ceases, and in a moment all is quiet. The data of the day is gathered together, and later will serve as the basis for midnight study, and perhaps for new theories as to locomotive proportions, or the design of some essential part.

Work in connection with this plant, which occurs at intervals throughout his senior year, discloses to the student the very pulse of the machine. Not only does he stand without fear in front of a locomotive when it is running 60 miles an hour, but he applies accessory apparatus of every sort, that the performance of every part of the machine may be observed.

When near the end of his course, the student-engineer begins the preparation of a thesis, usually a formal piece of work demanding the exercise of all his technical skill. The thesis of the mechanical engineer may be based either upon design or upon laboratory investigation. If upon design he has an opportunity to embody in an original manner many of the principles developed in his course. It is perhaps sufficient to say that the results recorded in the theses of students frequently find their way into the proceedings of the best of our American technical societies.

Retrospect and Prospect: Views of Railroad Presidents.*

Roswell Miller, Chairman Chicago, Milwaukee & St. Paul.

The prospect of rate maintenance is good. The labor situation I do not regard as serious. Can further advances in wages be granted? No.

There is reason for believing that railroad net earnings will go on increasing. Tendency to project new or parallel lines because of the prosperity of the country will not be so great as heretofore, because monied interests as a rule are against it.

O. D. Ashlay, Chairman Wabash Railroad.

The most satisfactory feature to me in the results of the past year is to be found in the steady growth of local business, especially in the Central-Western States. This improvement, which springs from the increasing density of the population and the spread of manufacturing industry, may be considered as a permanent advantage. In the ratio of the increase in local traffic the competition for through business will be diminished, and the maintenance of tariff rates will be more certain. Partly for these reasons, and partly through the control of the trunk lines, established by the "Community of Interest," rates have been more faithfully maintained during the last year, and are more likely to be maintained in the year to come.

An increase in new rolling stock has been stimulated partly by the requirements of the law as to automatic couplers and air-brakes, and partly by the per diem

*Extracts from interviews in the *Evening Post*, New York.

agreement as to the use of foreign cars. The first could not be economically applied to old cars, and the second has rendered the detention and use of foreign cars much more expensive.

B. D. Caldwell, Vice-President Delaware, Lackawanna & Western.

The maintenance of established tariff rates on freight traffic resulting largely from the injunctions secured by the United States Government, together with the disposition which is now being manifested to take out the reduced tariffs, so many of which were put in in the early part of the year to protect contract rates made prior to the injunctions, may properly be considered as the most encouraging result accomplished by the railroads during 1902.

With the present and promised improvement in rate conditions, it is not unlikely that the labor situation may prove the most serious question with which the railroads will be confronted in the near future.

*E. P. Ripley, President Atchison, Topeka
& Santa Fe.*

The prospects for the immediate future seem now to be quite as good as at any time in the past two years. We have harvested a large crop, which is being sold at good prices, and is further en-

poorest, but it seems to me that this is somewhat less popular than it has been.

I think nobody realizes how fast this country grows, and how rapidly undeveloped territory becomes profitable to the carriers that serve it. I have been newly surprised all through my railroad life at seeing the success of railroad projects which seemed to me at their inception utterly without merit. True, in most of these cases the original projectors lost their money in whole or in part, but eventually the country grows up to the road, and makes the latter successful.

be advanced in many cases. I am not a believer in any horizontal advance.

I doubt if net earnings grow or increase. They have probably reached the maximum. I should think that 1903 would see the largest gross business done in practically all departments of business that ever was known, but the net is likely to be somewhat less.

I doubt if there are any new or parallel lines built. The promoters seem to be devoting themselves to inter-urban lines and smaller projects. It is hardly to be thought that the railroads can go on bettering their condition in the future as in the past; at least for a few years they will probably go slower with improvements.

*Charles M. Hays, General Manager Grand Trunk
Railway.*

The continued increase in our passenger earnings was the most encouraging result of the past year from a railroad point of view, for the reason that it reflects, better than anything else, the continued prosperity of the community. Last year we had the Buffalo Exposition, and we were apprehensive this year would show a large decrease, but our passenger earnings show an increase of \$332,255 from January 1 to November 30.

The labor situation is perhaps as serious a feature as exists in connection with the railroad business. Although nearly all roads have made two or three increases in the payment of the various classes of employees since business commenced to improve in 1897, there is still an inclination in some directions among the employees to make demands on us for even higher rates of pay.

Thomas P. Fowler, President New York, Ontario & Western.

I do not regard the labor situation as serious, because the companies have evinced a disposition to treat the wage-earner fairly. Any further general advance in wages must depend upon the future financial prosperity of the companies, and on their ability to pay not only higher wages, but a greater return upon the capital invested. Capital, as well as labor, is entitled to participate in the benefits derived from increased earnings.

The tendency to project new or parallel lines in a growing and rich country, such as ours, will probably remain, but there is fortunately a tendency on the part of capital to discourage the investment of funds in parallel railroad enterprises. The experience of the past in that direction is likely to regulate future parallel projects, and hold them in check.

The Mississippi River Bridge at Thebes.

The large cantilever bridge under construction for the Southern Illinois & Missouri Bridge Company, across the Mississippi River at Thebes, Ill., which was begun last January, is making satisfactory progress, and it is the expectation to have it completed early in the spring of 1904, which will be practically in agreement with the provision of the Act of Congress authorizing its construction. Short descriptions of the bridge appeared in the *Railroad Gazette* Feb. 18 and March 14, 1902. In the latter article a general elevation was shown which has since been modified to the present design.

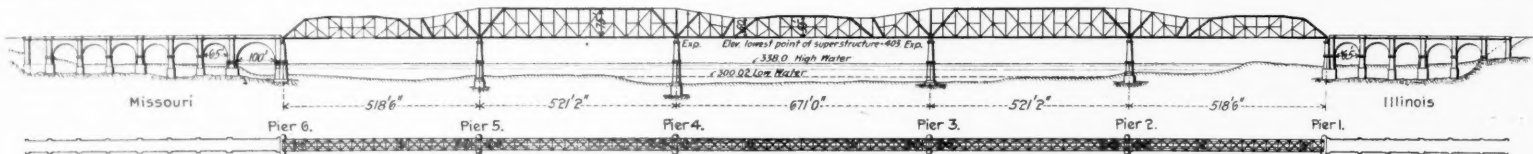
The purpose of the bridge is to form a connection be-

riching the already prosperous farming class which is at the foundation of all prosperity.

The rate situation remains about the statu quo, there having been no advances in the western territory notwithstanding large increases in wages and in cost of ma-

*M. E. Ingalls, President Cleveland, Cincinnati, Chicago
& St. Louis.*

I think we have passed the time when there will be any question about the maintenance of tariffs. It would hardly seem possible that any one would consent, or for



General Plan and Elevation of the Thebes Bridge over the Mississippi River.

terial. It is to be hoped that the general public will recognize the propriety of some advance in rates since everybody who patronizes the railroad is better able to pay. If the country is to go upon a higher plan of income and expenditure the railroads, of course, cannot be an exception, and must have additional income to meet additional expenditure.

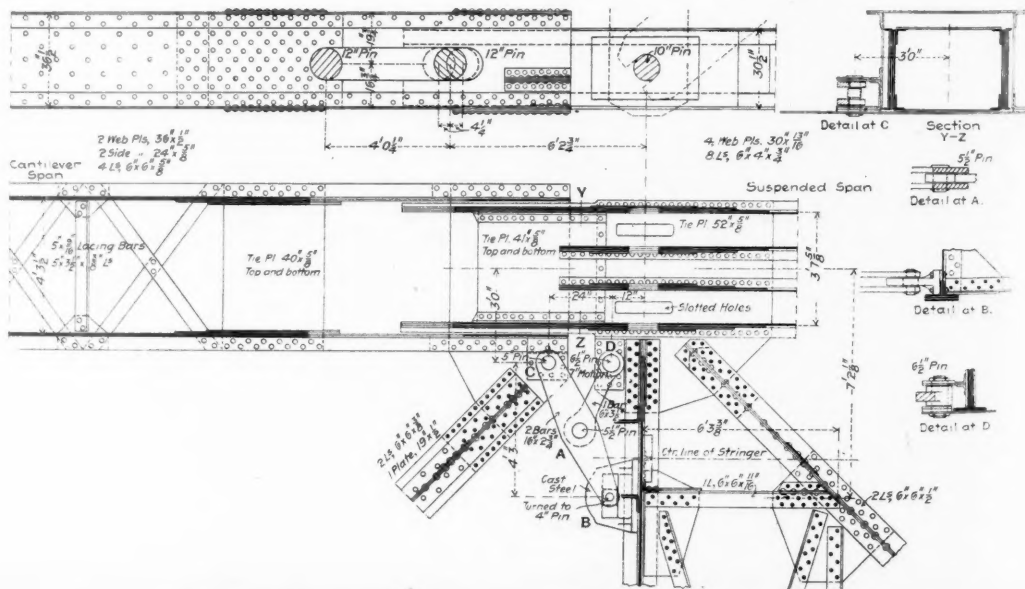
The most serious part of the labor situation is the scarcity of labor, especially of the unskilled class. Much work is being delayed, and much indefinitely postponed because of inability to obtain workers, in the face of which condition Congress is considering legislation which will bar a large amount of this commodity from entering the country. We have already excluded the Chinese, mainly at the instance of California, yet every one knows that the very best thing that could happen to that State would be the importation of two or three hundred thousand Chinese as house servants and laborers under proper restrictions. I do not mean that Chinese immigration should be unrestricted as to numbers, but there is so much undeveloped land and so few to work it that it will remain undeveloped for a long time if we wait for our native population.

As to so-called skilled labor, most of which is now "organized," I think it is getting more sense. I think it is getting better and more conservative leaders; that it is getting each year farther away from the idea of "striking first and negotiating afterwards": that it is gradually beginning to realize the responsibility that attaches to power. . . . I think relations between the railroads and their employees were never more cordial than at present. Naturally there are some exceptions. There are still some unions whose sole object seems to be to reduce the efficiency of the best workman to that of the

an instant think of going back to the old condition of affairs.

I do not consider the labor situation serious. There is rarely trouble on a rising scale. Wages will have to

tween the Illinois Central and Chicago & Eastern Illinois railroads on the one side, and the Missouri Pacific and the St. Louis Southwestern on the other, all of which are interested in the bridge company. Interchange traffic be-



Expansion Joint Between Cantilever and Suspended Spans—Thebes Bridge.

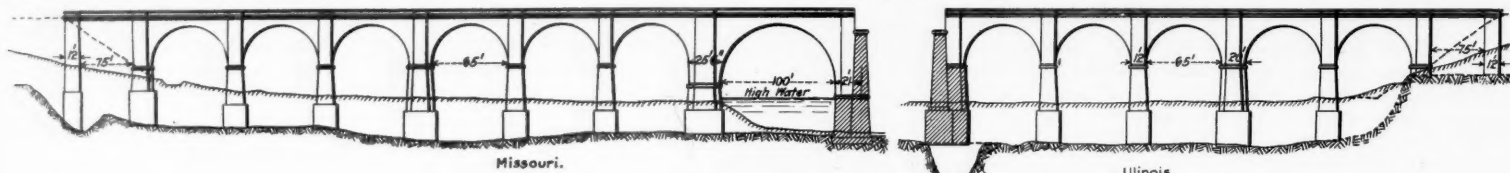
It will be observed on the engraving showing the general elevation that every third pier of the viaducts is a buttress pier. This is for the purpose of supporting the dead-load thrust of the adjoining arches.

The arches for the 65-ft. spans are 3 ft. 3 in. thick at the crown, while for the 100-ft. span this dimension is 4 ft. 6 in. In each arch, close to each side and to the in-

still allow 28 ft. clearance. In order to do this very close packing had to be resorted to at the various intersecting points of truss members.

It should be noticed that the trusses are of a single-intersection subdivided-panel type. Most of the cantilever spans built in the United States up to the present time have been of the double-intersection type, which has

to transmit the shear from the wind on the bottom chords. This device assures the parallel motion and dispenses with the ordinary arrangement of a slip-joint in the chords, which is always subject to binding and clogging up and is very difficult to keep in good condition. A similar member, only placed vertically, has been used at the ends of the stringers in the end panel of the canti-



Arch Viaduct Approaches—Thebes Bridge.

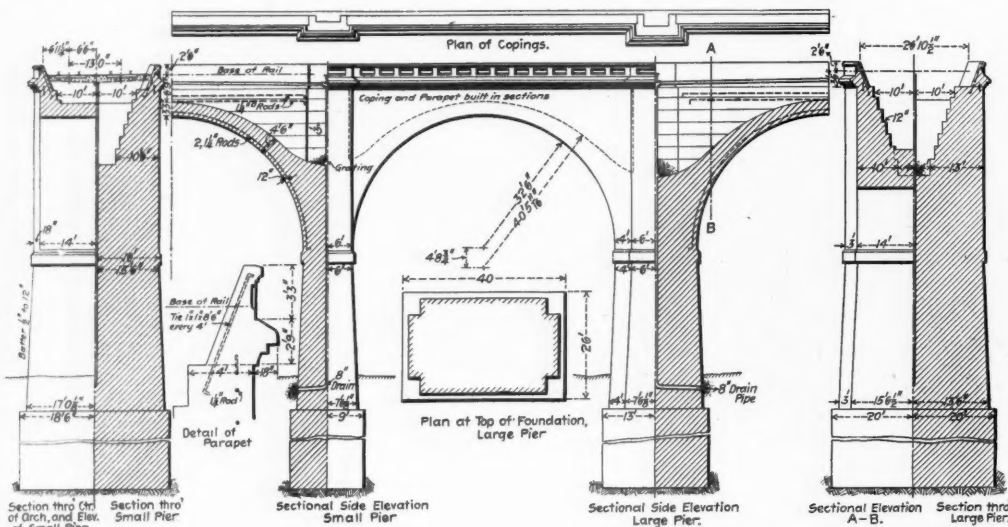
trados, are placed two 1 1/4-in. rods to prevent surface cracks. The same provision is made in the spandrel walls just below the coping. Each section of spandrel wall has, over the piers, open expansion joints 1 in. wide. They are loosely packed along the back of the joint with

some disadvantage in the ambiguity of stresses. The type of truss adopted admits of a very efficient floor beam connection which would not be the case with a triangular "Warren" system. The suspended span has been made 50 ft. at the ends and 55 ft. at the center. The purpose

lever arms. This device was first designed by Mr. Modjeski for use on the Memphis bridge and worked with entire success. An illustration of the device is shown.

All lateral and sway bracing is stiff, built of angles riveted to lateral plates, which in their turn are riveted to the top chords. In spans of this length the lateral vibration is liable to be excessive, as is demonstrated on the existing cantilever bridges. It is expected that this stiff bracing will reduce this vibration considerably.

The two center panels of the bottom chord of the suspended spans have been made of eyebars. It is expected that this will assist in the connecting of the structure while the center span is being erected without falsework. Wedges lubricated with graphite and tallow will be used for adjusting the structure as the two projecting ends will come together. It can readily be seen that by slightly bending the eyebars in a lateral direction or by inclining them in a vertical direction slight inaccuracies



Details of Arches in Approaches.

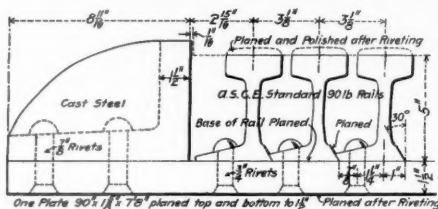
asbestos and coated with asphaltum for protection against water and foreign substances.

The opening between the spandrel walls is 20 ft. at the top. This opening is reduced by successive steps 1 ft. wide in each wall, making the width over the crown 18 ft., and over the pier 10 ft. for the smaller, and 8 ft. for the larger. The filling for the opening is to be sand up to a height of about 5 ft. above the crown of the arches, which will be the sub-grade level. In the bottoms of the spandrel pits is a grating for drainage, and over this will be a filling of coarse stones. The entire filling is to be thoroughly wet and tamped down. The top of the fill is to be graded with a slight slope from the center of the arch toward the piers and from the walls toward the center of the approach.

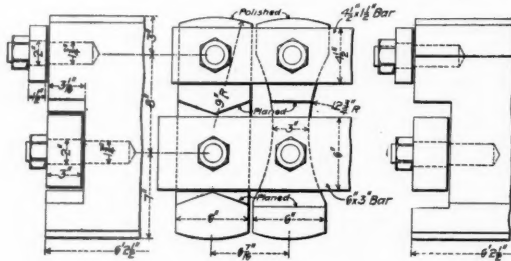
Underlying the ballast, between the tracks, are 6-in.

of reducing the height at the ends is to give the inclined posts in the last panel of the cantilever arms an inclination sufficiently great to admit of a satisfactory floor beam connection. This has also for effect, to better define the point of suspension of the suspended spans.

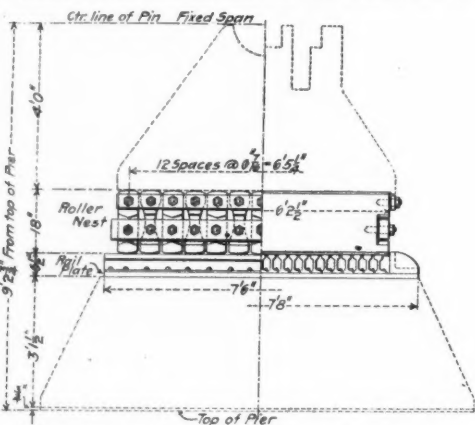
The compression chords, as well as those subject to reversal of stress, are all built with four webs and eight angles. The top chords are 42 in. deep in the fixed spans, and the bottom chords are 36 in. deep. The main pins in the trusses are generally 14 in. in diameter, while the



Detail of Rail Plate.



Detail of Rollers.



Half End View.

Half Side View.

Details of Bearings—Thebes Bridge.

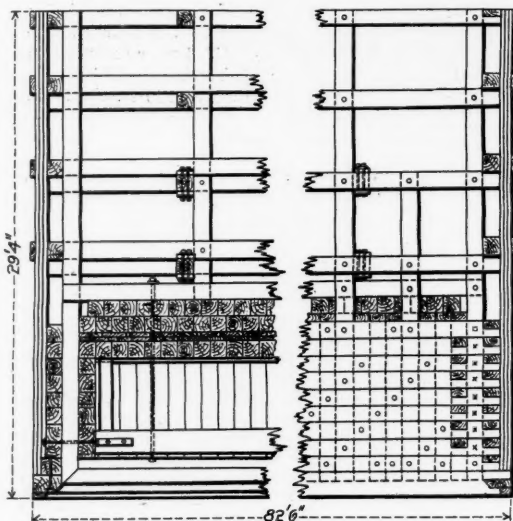
porous drain tiles which follow the slope of the sub-grade to a junction with 8-in. iron drain pipes, running down through the center of each pier and discharging at the side of the pier near the bottom. The gratings in the spandrel pits admit the drainage from the pits to these pipes. To facilitate drainage the top surface of the arches and the inside surface of the spandrel walls are plastered with a thin coat of mortar and coated with asphaltum.

The concrete coping and parapet will probably be built in sections separate from the body of the work and will be secured to the spandrel walls by tie bars and dowels placed every 4 ft. However, if it is found that just as good work can be done by building a monolithic parapet in place on the walls the contractor will be permitted to do so. The distances between trusses will be 32 ft. center to center. This was made as small as was possible to

main bearing pins under the ends of the fixed spans will be 18 in. in diameter. All pins of large diameter will be bored through the center.

The largest eyebars are 14 x 2 1/2 in. in diameter. In order not to exceed the weight of 4,800 lbs. for one bar, it was necessary in one case to subdivide the diagonals by placing an intermediate pin half way between the connecting point on the top chord and the middle of the height of the truss. This point is shown on the accompanying detail of fixed-span trusses. In another case three bars 14 x 1 3/8 in. are riveted together for the same purpose. This limiting weight of 4,800 lbs. was imposed by the manufacturers and seems to be the limit which cannot now be conveniently exceeded without excessive difficulties in manufacture.

At the ends of the cantilever arms where 14 in. of expansion is liable to occur, a special device has been placed



Side Elevation and Section of Caisson for Pier 3.

in the position of the pin holes at the center point of the bottom chord can be corrected and the pin driven easier than would be the case with a stiff bottom chord.

In the general character of the details one can observe that angle lacing has been used quite liberally, although not everywhere. It was deemed better to use flat bar lacing entirely in the four welled top and bottom chords. The lacing of these chords is made by latching the four webs in pairs and by connecting the two inside webs with tie plates.

It might be mentioned that a general design was considered on independent spans with curved top chords. While that kind of a structure would have been somewhat preferable, yet upon carefully estimating, it not only would have been more expensive but would present serious difficulties and risks in erection which would have to be done on falsework, while the structure as designed will be erected without falsework in the center span. Of course, falsework will be used for the erection of the two fixed spans and the two shore arms. The risk, however, would be considerably less. It would be impossible to drive piles for the falsework in the center span. In fact, it may be necessary to place on cribs the falsework for the other spans.

The design of the bridge is by Messrs. Alfred Noble and Ralph Modjeski, Chicago, who are likewise engineers for the entire work. Mr. W. E. Angier is Resident Engineer. The contracts for the various parts of the work were awarded as follows: Entire superstructure to the American Bridge Co., New York; concrete piers and foundations to C. Macdonald & Co., New York; concrete approach viaducts to the J. S. Patterson Construction Co., Chicago; grading of approaches to McArthur Bros., Chicago.

This latter required an amount of excavation approximating 320,000 cu. yds. on the Illinois side and 300,000 cu. yds. on the Missouri side. The estimated approximate cost of the entire work is \$2,600,000, apportioned as follows:

Superstructure	\$1,300,000
Substructure (main bridge)	540,000
Concrete approaches	270,000
Earthwork approaches	280,000
Engineering and contingencies	210,000
Total	\$2,600,000

Tandem Compound Consolidation Locomotive for the Cape Government Railroads, South Africa.

In our issue of Aug. 30, 1901, we described one of the four-cylinder tandem compounds built for the Northern Pacific by the Schenectady Works of the American Locomotive Company. It will be remembered that the first engine of this type built by the Schenectady Works was for the Northern Pacific in 1900.

The engine which we illustrate now is the first narrow gage locomotive that has ever been built with tandem compound cylinders of this design. For a detailed description of this system of compounding we refer the reader to the account of the Northern Pacific tandems.

The gage is 3 ft. 6 in. The cylinders are 13 in. and 23 in. in diameter with a stroke of 26 in. The total weight in working order is 127,500 lbs., with 112,000 lbs. on the drivers. The total heating surface is 1,407.3 sq. ft., and the grate area is 20.03 sq. ft. The total volume of the low pressure cylinder on one side is 12.5 cu. ft. The fire-box is copper.

Some of the typical ratios are as follows:

Weight on drivers divided by heating surface.....	79.6
Total weight divided by heating surface.....	90.5
Heating surface divided by grate area.....	70.4
Tube surface divided by fire-box heating surface.....	10.1
Heating surface divided by cylinder volume.....	12.5
Grate area divided by cylinder volume.....	1.60

The engine and tender weigh in working order 206,200 lbs. The tank capacity is 3,750 gallons, and the coal capacity is 6½ tons.

The special equipment includes Jerome piston rod packing, Passaic iron crown staying, two Cape pattern Gresham & Cravens injectors, and steam brakes on two pairs of drivers with automatic vacuum and hand-brake on tender and train. General dimensions follow:

Gage.....	3 ft. 6 in.
Simple or compound.....	Tandem compound
Kind of fuel to be used.....	Bituminous
Weight on drivers.....	112,000 lbs.
Weight on truck wheels.....	15,500 lbs.
Weight, total.....	127,500 lbs.
Weight tender, loaded.....	78,700 lbs.

General Dimensions.

Wheel base, total of engine.....	22 ft. 2 in.
Wheel base, driving.....	14 ft. 6 in.
Wheel base, total (engine and tender).....	46 ft. 6 in.
Height of stack.....	12 ft. 10 in.
Heating surface, fire-box.....	126.6 sq. ft.
Heating surface, tubes.....	1,280.7 sq. ft.
Heating surface, total.....	1,407.3 sq. ft.
Grate area.....	20.03 sq. ft.

Wheels and Journals.

Drivers, number.....	8
Drivers, diameter.....	48 in.
Drivers, material of centers.....	Cast steel
Truck wheels, diameter.....	28½ in.
Journals, driving axle, size.....	7½ and 7 in. x 8½ in.

Cylinders.

Cylinders, diameter.....	13 in. and 23 in.
Piston stroke.....	26 in.
Piston rod, diameter.....	2¾ in. x 3¼ in.

Valves.

Valves, kind of.....	Piston
Valves, greatest travel.....	5½ in.
Valves, outside lap.....	1 in.
Valves, inside lap or clearance.....	0 and 1 in.
Valves, lead in full gear.....	¾ in.

Boiler.

Boiler, type of.....	Straight
Boiler, working steam pressure.....	200 lbs.
Boiler, material in barrel.....	Worth steel
Boiler, diameter of barrel.....	60¾ in.
Seams, kind of horizontal.....	Butt, sextuple
Seams, kind of circumferential.....	Double riveted
Thickness of tube sheets.....	9/16 in. and ¾ in.
Thickness of crown sheet.....	¾ in.
Crown sheet stayed with.....	Passaic iron, 1½ in.

Fire-box.

Fire-box, length.....	8 ft. 5 3/16 in.
Fire-box, width.....	2 ft. 4½ in.
Fire-box, depth front.....	65¼ in.
Fire-box, depth back.....	53 in.
Fire-box, material.....	Copper
Fire-box, brick arch? Yes. No.....	Yes
Fire-box, water space, width; Front, 3¼ in.; sides, 3¼ in.; back, 3¼ in.	

Grate, kind of.....	Rocking
Tubes, number.....	196
Tubes, material.....	National iron
Tubes, outside diameter.....	2 in.
Tubes, length over sheets.....	12 ft. 7½ in.

Other Parts.

Exhaust nozzle, single or double.....	Single
Exhaust nozzle, diameter.....	4¼, 4½ and 4¾ in.
Stack, diameter.....	14 and 16 in.

Tender.

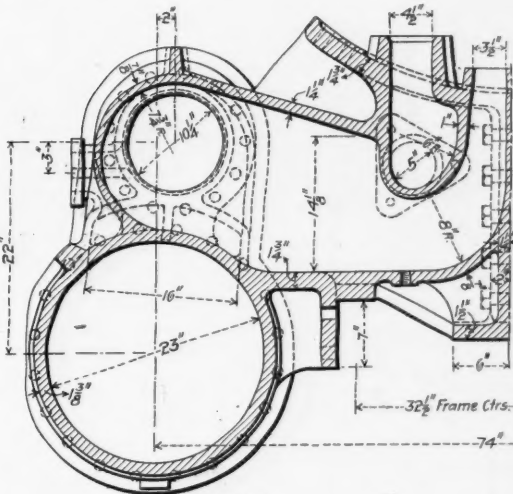
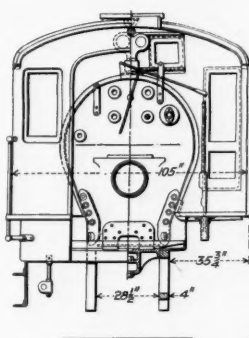
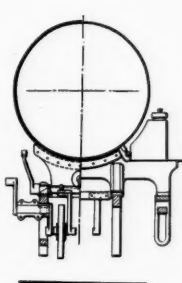
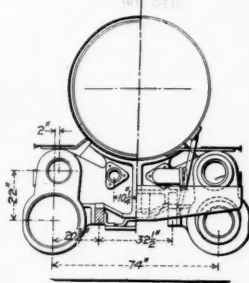
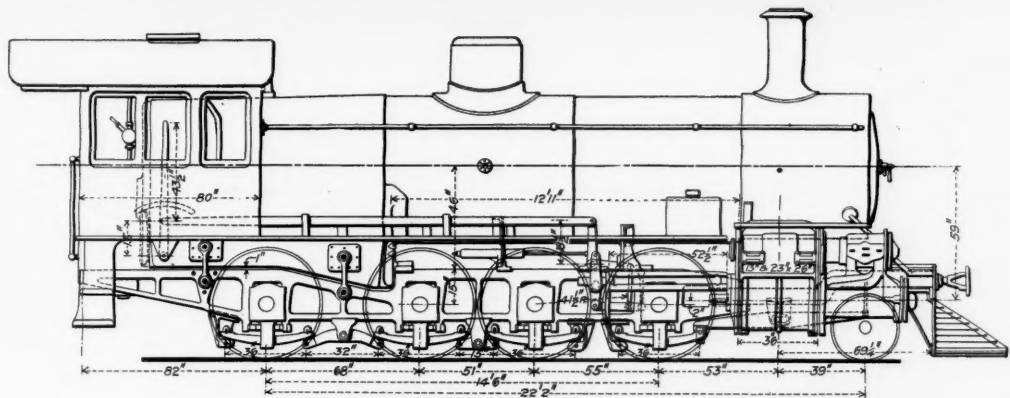
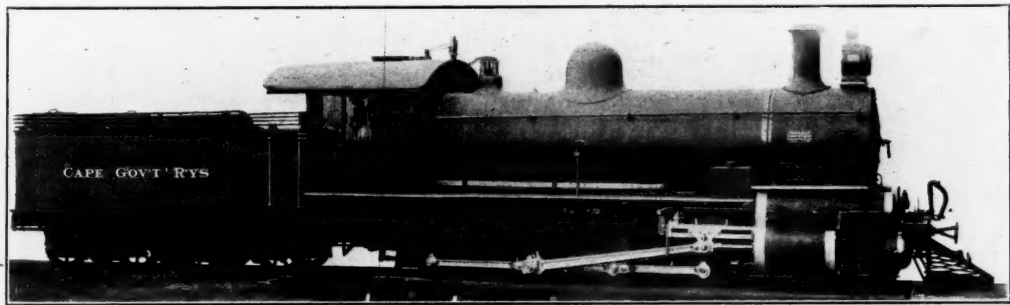
Type.....	8 wheel
Tank capacity for water.....	3,750 gal.
Coal capacity.....	6½ tons
Type of underframe.....	Steel plates and channels
Type of truck.....	Channel iron center bearing
Diameter of truck wheels.....	33½ in.
Diameter and length of axle journals.....	4¾ x 9 in.

Foreign Railroad Notes.

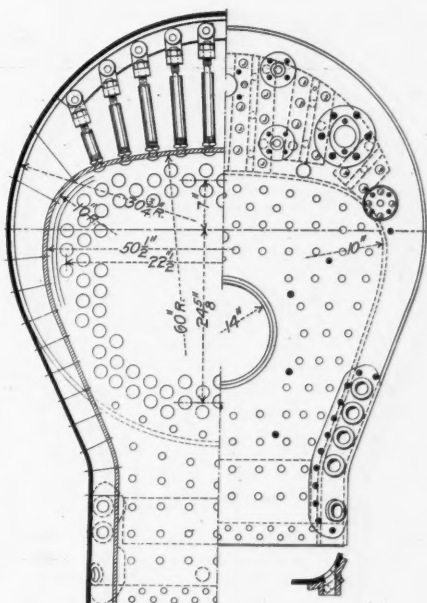
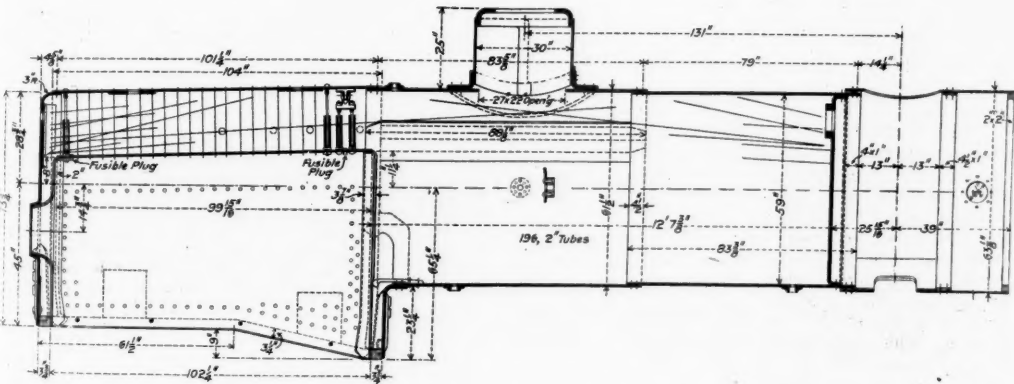
The rails are reported laid on the French Abyssinian Railroad for 178 miles from the coast. It is desired to extend it about 250 miles further.

The railroads of the continent of Europe have for some years united in an international agreement for the interchange of freight going from one country to another, with uniform bills of lading, and other regulations, for which the laws of some of the countries have been modified. The length of the lines which carry freight under these uniform regulations April 1 last was 126,740 miles, including 32,700 miles in Germany, 31,165 in Russia, 23,708 in France, etc.

Great complaint is made of the bad ventilation of the underground sections of the new Paris City Railroad. Investigation by the Board of Health has shown a great



Cylinder.



Tandem Compound Consolidation Locomotive—Cape Government Railroads.

excess of carbonic acid gas in the tunnel, and it recommends ventilating chimneys at intervals along the line and the use of blowing machines to maintain a circulation. It suggests that the car windows be made larger and several small electric ventilators be placed in each car.

Requirements of Machine Tool Operation with Special Reference to the Motor Drive.*

Intelligent analysis is the only method to pursue in work of this kind, but as stated in the beginning of this paper, we must ever keep before us a broad view of the subject, that the relative importance of the various factors be evident. It is easy to become so interested in a given detail—the motor drive as an example—that its true position in the general scheme is entirely lost sight of—our judgment, as a consequence, is of little value. This fact has been impressed upon us so often when aiming at more efficient production, analyzing the condi-

We will now devote our attention to shop conditions, and, if necessary, it would be easy to analyze still further the fixed charges, labor and material shown above. The former can be divided into insurance, depreciation, repairs, power, etc. Labor may be subdivided into productive and non-productive, and material into proportion of steel, cast-iron, brass, etc. The more subtle factors, such as sanitary conditions and light, must also be constantly borne in mind.

Of all these factors we will consider only the equipment and means which may be necessary to enable the workman to use it to its full capacity. We must start in the pattern shop or forge department, and see that everything is done to facilitate future handling and machining. A lug on a heavy casting to make it easy to catch hold with the crane, or in some cases additional metal to remove, to prevent the possibility of working too close to the chilled scale, will frequently effect more saving than is possible by other means.

I wish to be understood that my remarks from now

steel will give a finer finish on steel than the air-hardening variety, and for form cutters is still largely used. Where heavy roughing cuts are possible, air-hardening steel has unquestionably replaced it; and, in fact, the recent developments in the processes of hardening have been the direct means of revolutionizing old methods of machine tool design and so-called shop practice.

We must ever bear in mind that "best shop practice" should mean "arriving at the desired result at the least cost," and can be used in a relative sense only. We constantly hear machinists condemn a means of arriving at a result irrespective of its merits, their reason being that "it is not good practice." If drilling with a feed of 1/16 of an inch per revolution gives the desired finish in much less time, it is certainly good practice, and if under these conditions we find a sharp point on the drill is not essential, so much the better. I have cited this particular instance as it recently came under our notice, when experimenting with some twist drills, which continued to do good work when pronounced as ruined by

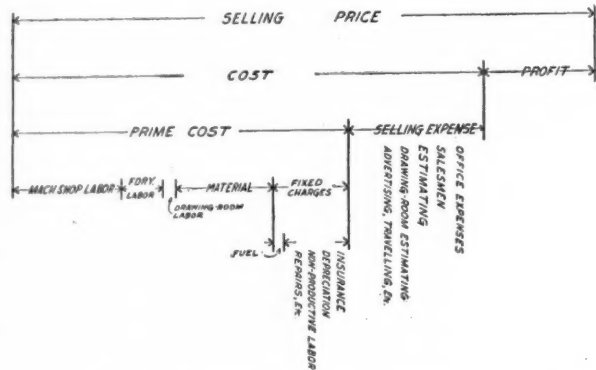


Fig. 1.—Graphical Distribution of Selling Price.

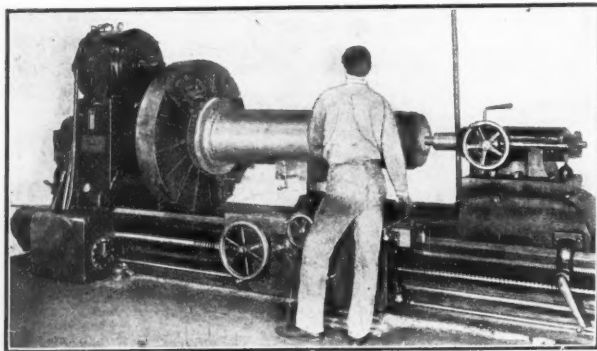


Fig. 5.—Lathe Driven by Variable Speed Motor (Four Wire System).

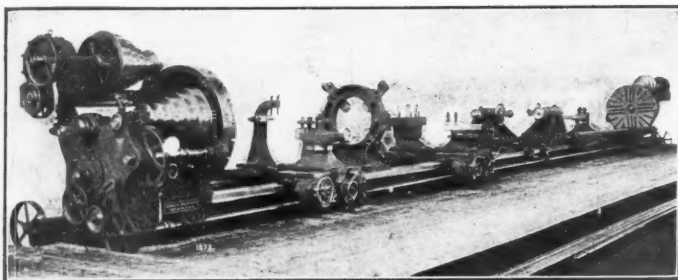


Fig. 4.—Lathe Driven by Induction Motor.

tions in the shop and studying the various methods employed, that I feel we may dwell upon it here.

As an example, we will consider a plant composed of a foundry, machine shop and office, manufacturing complete machines from the crude material. The only way the relative data can be quickly grasped is by presenting it graphically to the mind; the chart, Fig. 1, may be taken as the distribution of cost of the finished product of the plant in question. When the data can be compared in this way the relative importance of each factor can be realized at a glance, the advisability of an expenditure of energy or money in any direction readily determined.

We may have seemed to digress somewhat from the point at issue, viz.: the application of the motor in the machine shop, but we are anxious to impress upon you the importance of a thorough understanding of the requirements and conditions before entering upon details with which you are more or less familiar. Referring again to the graphical distribution of the selling price, the part that is of interest to the shop manager is the prime cost; it should be his object at all times to lower this figure.

*Abstract of a paper presented by Mr. Charles Day, of the firm of Dodge & Day, modernizing engineers, before the New York Electrical Society, Dec. 18, 1902.

on will relate to shops doing a general class of work, as it is much easier to arrive at a high standard where parts are duplicated in large numbers. In the latter case we can profit by experience, while in the former we must anticipate each move. In one instance machines are designed for a given duty, while in the second they must be adapted to a certain class of work, and as a result seldom handle any job to the best advantage.

We must ever keep in mind that the object of our work should be to execute a job most efficiently the first time in the shop; efficiency being used in the broadest sense and not necessarily implying that the cheapest production is arrived at as attained when manufacturing in quantity, as special tools such as are frequently required in such a case would not be justified.

Referring again to the example under consideration, we will suppose the castings have been received in the shop and the method of machining determined upon. A certain amount of metal has to be removed and a definite finish is required, our object being to accomplish this result in the least possible time, or rather at the least expense.

The tool steel is the keynote to the situation, and a complete knowledge of its characteristics and possibilities form the starting point for all further work. Carbon

several machinists who were watching the tests.

An exact knowledge of the cutting speeds of which these tools will permit when machining different materials, and the power to pull various cuts under all conditions, are absolutely essential if we wish to properly design machine tools, or use them to their full capabilities in actual service. The value of this information is now being realized by several of the machine tool builders, and the results are already being felt in the shop in the form of much more efficient machine tools.

The motor drive makes the measurement of power so simple that we may arrive at these results with comparatively little difficulty. We have recently conducted in the shops of our clients, the Link-Belt Engineering Company, a series of experiments to determine the best air-hardening tool steel for use on cast-iron. This particular lathe gives 126 spindle speeds, increasing in 5 per cent. increments, and is especially adapted to this work. Electrical instruments give a record of the energy absorbed and the cutting speeds were carefully determined by suitable instruments.

Fig. 2 is a portion of a record and shows our method of tabulating this data. One hundred and twenty-five tests on various tools were made in this series of experiments, the depth of cut and feed being kept constant

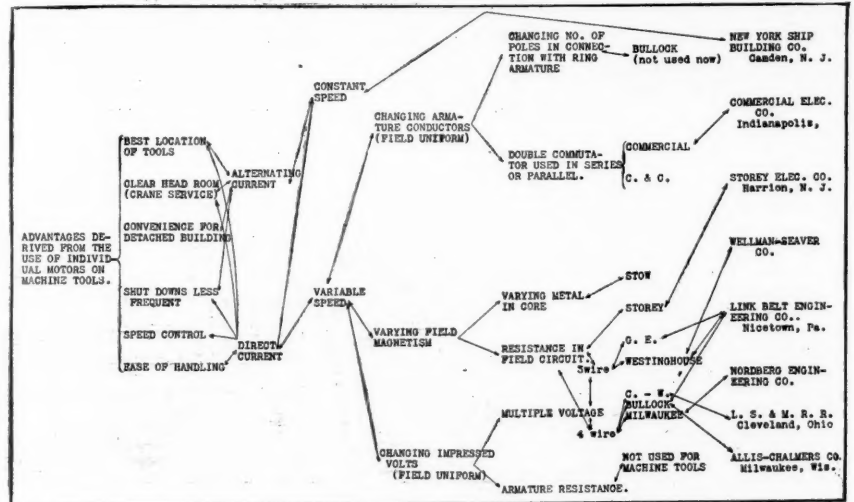


Fig. 3.—Principal Advantages and Methods for Driving Machine Tools.

November, 24th, 1902. Kind of Steel in Tool SELF HARDENING.
Forging No. Cast Iron. Kind of Tool Right Hand Roughing.
Cutting (Dry) TOOL—1 1/2" by 3/4" Clearance Angle of Tool 8 Degrees.
Rate Angle of Tool Front 2 Degrees. Side 20 Degrees.

Experiment Number	Feed	Depth of Cut	Cutting speed in Feet per minute	Mark on Tool	Direction of Cut in relation to work	Diameter of Cut in inches	Feed in inches	Down at Bottom of Cut in inches	Feet of metal from Top and Bottom of Cut	Volts	Amperes	Spindle Speed	Remarks
24	.0606	3/16	97'	Taylor White H.S.S. No.1	16 1/2	2 1/4	21	0	130	30	16 1/2	161	RUINED.
25	.0606	3/16	105	Capitol No.1	20	"	"	16 1/2	170	24	21 1/2	21 1/2	FAIR.
26	"	"	105.5	Capitol No.2	20	"	"	37 1/2	171	24	22 1/2	22 1/2	GOOD.
27	"	"	104	Capitol No.3	15	21"	20 1/2	0	167	27	16 1/2	16 1/2	RUINED.
28	"	"	104	Taylor White No.1 T.W.	11 1/2	"	"	14 1/2	164	26	12 1/2	12 1/2	RUINED.
29	"	"	100	Jessop No.1	20	"	"	27	132	26	20 1/2	20 1/2	GOOD.
30	"	"	105	Jessop No.2	20	20 1/2	20 1/2	0	166	24	22 1/2	22 1/2	RUINED.
31	"	"	107	Jessop No.1	20	"	"	22 1/2	168	24	23	23	GOOD.
32	"	"	115.5	Jessop No.4	13	"	"	43 1/2	168	25	16 1/2	16 1/2	GOOD.
33	"	"	125	Jessop No.3	2 1/2	20 1/2	16 1/2	0	166	26	3	3	RUINED.
34	"	"	118	Jessop No.2	10 3/4	"	"	2 1/2	167	26	15 1/2	15 1/2	RUINED.
35	"	"	109	"	"	"	"	"	170	26	"	"	"

Fig. 2.—Method of Tabulating Tests on Tool Steel.

and the speed varied so that the tool would last just 20 minutes.

It is not now my intention to discuss the subject of machine tool design, but I do wish to say that the most inefficient part of most shops is the machine equipment, and until the user of this apparatus realizes this point and demands machines designed along the correct lines, the desired result will not be reached. It matters not what type of tool we consider, its shortcomings can be readily pointed out. The feeds on the average drill press are ridiculously low, the power supplied and rigidity of the frame on machines using multiple cutters are out of all proportion to the work we should be able to absorb at the cut, and so on.

In all discussions of this kind we must ever keep before us the fact that some work will permit of heavy cuts and coarse feeds and some will not, but even in the latter cases there are many ways open to cheapen production. Where the work is light and the operations of but short duration, it is very essential that the changes in speed should be obtained with the least loss of time; in other words, "ease of handling" is a most important factor.

A machine having been designed for a given duty, its maximum and minimum speeds are limited by the char-

of the various handles and gears controlling these factors. These slide rules must be in the hands of a force of men who are perfectly conversant with machine shop work and able to lay out the course any particular piece should pursue in going through the shop. The value of these rules—if surrounded by the proper organization—has been fully exemplified by Mr. Taylor at the Bethlehem steel works.

It is possible, by careful observation and experiment, to ascertain approximately for a given shop the cutting speeds of which various jobs will permit, so it is absolutely essential to have some good means of determining it. It is impossible to judge the speed by eye, even where a man works on the same tool continuously; nor will the character of the chip when cutting cast-iron indicate the proper speed.

As a means of remedying this difficulty, we have used charts, which enabled the men to ascertain the cutting speed from a knowledge of the diameter of the work and position of belt and gears. A much better scheme than the charts is the use of tables designating the spindle speed for each point of the controller or position of the belt, as feeds are frequently enumerated on lathes, etc.

When slide rules are not used, a "speed tally" on each machine would be the only proper way of enabling the

advise its use on every machine, our views on this subject being rather conservative. The accompanying chart, Fig. 3, was made by us some months ago to show at a glance the different methods on the market for motor-driving machines. The constant speed motor, particularly of the alternating type, is so simple in character we naturally turn to it as a possible solution to the problem. It lacks, however, the two great essentials, ease of handling and speed regulation, and all attempts to supply these shortcomings by mechanical means have so far proved unsatisfactory.

The induction motor is a source of power, just as the line shaft and the principal advantages resulting from its use are clear overhead room, independent location and possibly a saving in power. These features are all embodied on the lathe shown in Fig. 4, but the inefficiency of the outfit from other causes makes this application out of the question. The motor is handled from the head stock, and as a result the ease of handling is far inferior to the old belt and shifting pole. The heavy double belt of such short centers must be tightened to such an extent that much time is lost in shifting, and in many instances it would not pay to do so.

When the operator is working at a distance from the head stock on a job where the tool is liable to dig in and

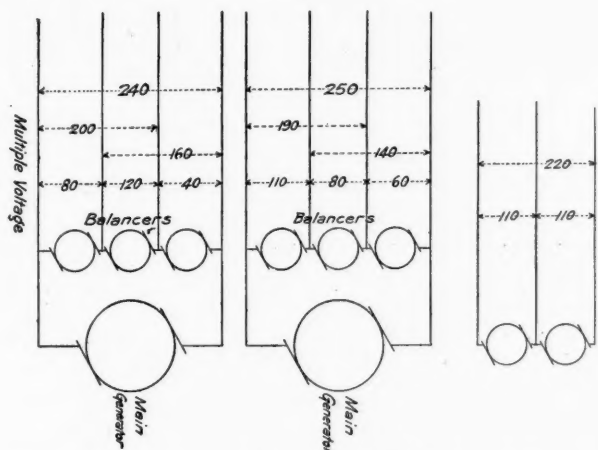


Fig. 6.—Scheme of Voltages for Three and Four Wire Systems.

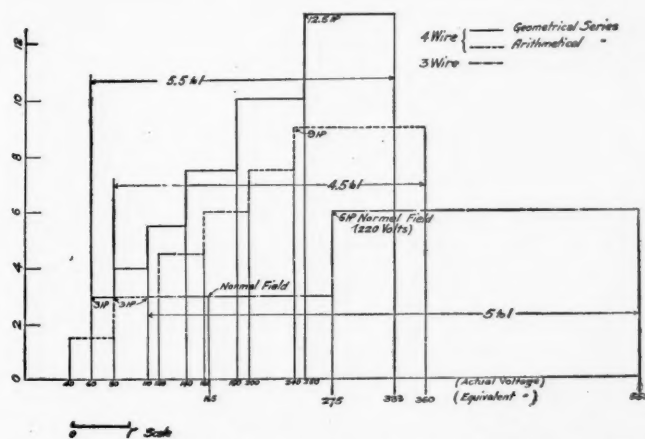


Fig. 7.—Horse-Power Curves of Three and Four Wire Systems (see Fig 6).

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Fig. 8.—Table of Gear Data (Bullard Boring Mill).

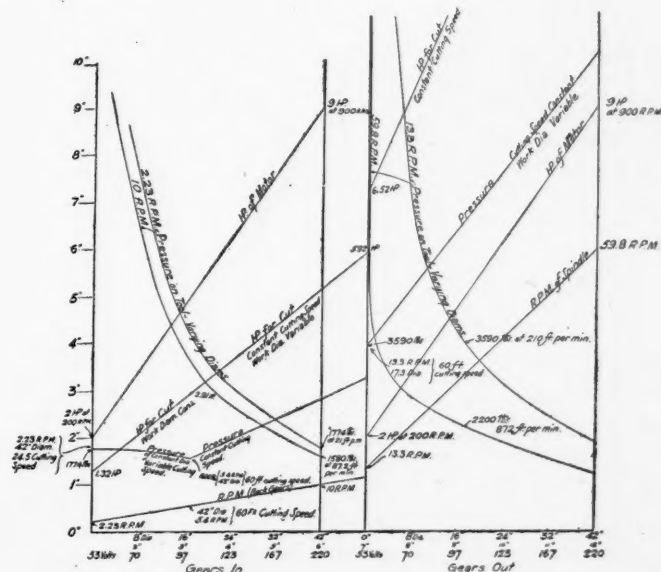


Fig. 9.—Principal Data Relative to Driving Mechanism (Bullard Boring Mill.)

acter of the work it will do; the number of speeds is determined by the character of the metal machined, and the uniformity of the tool steel and the power required is fixed by the most severe conditions it must meet. For the average machine tool we do not think present conditions demand a closer speed regulation than 10 per cent., as no good means has yet been reached for determining the character of the metal, and in the average shop little is understood about the relations existing between feed, speed and depth of cut for various materials.

There are two sides to the question, viz.: the refinement of speed required by the various elements with which we are dealing and the possibility of using this refinement to its full efficiency in actual practice. The first set of requirements may demand a speed regulation of 10 per cent., while the second would indicate that it is extremely difficult to use it to advantage in actual practice with present facilities. We have recently visited nearly every shop in this country where an extensive motor equipment has been installed and without exception have found these conditions to exist.

For certain classes of work, slide rules based upon the empirical formulæ referred to above seem to us to be the only solution to the problem. By means of these it becomes possible to instruct the workmen how to do the work to insure maximum efficiency, the feeds, speeds and cuts all being dictated indirectly by the positions

workman to know the speed at all times. No skill is required in its use or time lost in making the reading. A tachometer suitable for this work has not yet been placed upon the market, but on a recent visit to Milwaukee, I had the pleasure of seeing one that has been developed and patented by Mr. A. P. Warner, of the Northern Electrical Manufacturing Company, of Madison, Wis., and which I think will meet all requirements.

In our estimation the most characteristic and valuable features of the electrical systems, which we will now consider, are the elimination of complication and physical effort in handling the machines, and the direct advantage resulting from this cause may be very far-reaching.

The inefficiency of the belt and step cones, as a means of machine tool driving, even when installed in such a way as to permit of good crane service, is too well understood to demand much consideration here. It is not a question of does it fulfil present conditions, but will it meet the new requirements resulting from the advance in tool steel, and our better knowledge on the subject? It certainly will not.

The motor is an equally poor investment if, after its introduction, the shop is run along the same old lines, and for this reason an understanding of its possibilities is most essential. I refer, of course, to the motor on individual tools, and, although my remarks are general in character, it is understood that we do not for a moment

cause trouble, it becomes necessary to have a helper at the switch to shut down the motor upon signal from the machinist, the inefficiency of such an arrangement being self-evident. In comparison with this lathe another illustration of the 48-in. Lodge & Shipley lathe, Fig. 5, showing the operator varying the speed, may be interesting. The control is always under the hand of the machinist. The controller is shown attached to the bed under the head stock, and the four-pole fused switch of specially heavy design is bolted to the head casting. The motor is a standard type and can be replaced on short notice in case of accident.

The variable speed counter-shaft would seem to be a natural solution, and in this connection I think I can safely say we have tested all the principal designs on the market. Speaking generally we have arrived at the conclusion that all such devices that depend upon power transmission through frictions, are unsatisfactory for general adoption in the shop, and in most cases the method of handling is not comparable with the multi-voltage systems that I will describe later. We feel that a variable speed counter-shaft that is to meet with the success anticipated by some engineers must be handled from a master control, and in fact do everything that is possible with the highly perfected electrical systems that are now being installed.

Fig. 6 shows the schemes of voltages adopted by the

principal manufacturers of multiple-voltage apparatus, one sketch showing a three-wire system and the other two four-wire systems, the voltages being arranged in geometrical and arithmetical progression respectively. In the first instance but two voltages are used, while in the latter cases six are possible. Intermediate speeds are obtained by inserting resistance in the field, 100 per cent. variation being necessary in the three-wire systems, as compared with 30 per cent. in the four-wire. In either case the horse-power that the motor can develop satisfactorily is directly proportional to the voltage.

A comparison of the underlying principles of these systems is clearly shown by the accompanying curves, Fig. 7. It is interesting to note the relative sizes of motors required to obtain a given range, but in this connection we must not form a hasty conclusion, as the cost for a given horse-power depends upon the system adopted. That is, with the three-wire scheme there may be a variation in speed of 150 per cent. by field weakening alone, a special field winding being necessary. In a desirable system, standard motors should be utilized, the controller operated by a single handle, and the entire range of speeds passed over while the work continues.

The range of motor speeds is a most important factor, as the first cost of the motor, the cost of the installation and the efficiency of the outfit are all dependent upon it. It is impossible to lay down any fixed rules to base our discussion on, as each machine is a different problem, and must be treated as such. For general machine shop work we have found that a range of 4 to 1 to 6 to 1 adapts itself to all conditions fairly well, but in every case where old tools are being equipped we must be satisfied with a compromise.

In applying a motor the horse-power is first figured from the maximum cut to be removed, but as the machine is frequently too weak to stand this work it is always essential to investigate the gears and other details. The gear strengths are based upon Wilfred Lewis' formula and the weakest gear is readily determined when the data is gotten into such shape as is shown in Fig. 8. For a given cutting speed the least cross section of cut that can be removed is at the slowest spindle speed of each reduction; the column shown to the right represents the pressure on the tool that can be exerted at this point.

The curves (Fig. 9) cover the principal data relative to the driving mechanism, and show at once the cuts that can safely be removed on any diameter at any speed. The motor horse-power is also plotted and the overload that the gears are subjected to is clearly shown.

We must study present conditions and in each case see how much they will be bettered by the use of a motor. Crane service alone may be ample reason for its adoption, or, again, where the intelligence of the men or facilities offered, make it possible to run each tool to its limit. We must ever remember that the belt drive, as applied to most machines, does not permit of running to the tool limit on the average job, while the motor, if properly installed, offers the opportunity. It can do nothing more.

If we cannot accurately figure beforehand what economy will result from the use of the motor, it may at least be of interest to investigate the records of shops who have made such installations. We must, however, be very careful not to draw too hasty conclusions as to the merits of the apparatus from such investigations, as the equipment is utterly useless without the management and organization behind it.

In the shops of the Link-Belt Engineering Company, an accurate record, extending over five years, gives the pound cost of machining, and the reduction in this figure during this period gives a more accurate gage of the economy effected than any other method. These figures were compiled by a disinterested party, and after taking into account every detail which might in any way introduce an error, and allowing the men a decrease of 10 per cent. in time, with the same wages per week, a clear saving of 30 per cent. on the entire labor bill was shown. The problem is such an involved one that it would be decidedly wrong to attribute this sum to any direct cause, it being the result of better management, equipment and understanding of its possibilities. It is needless to say that this saving is vastly in excess of the interest and depreciation of the entire expenditures necessary to bring about the result.

Large Steamships Now Building in American Yards.

The *Marine Review* publishes a list of ships now building in the various ship yards of the United States, which includes several large steamships for foreign service. The two cargo and passenger steamers which the Eastern Ship Building Co., New London, Conn., is building for the Pacific trade of the Great Northern, are the largest, and are 630 ft. long. Their contract price is \$2,500,000. Next in size are the six ships for the Atlantic Transport Line, two of which, the "Maine" and "Missouri," are building at the Maryland Steel Works, at Sparrows Point, and the remaining four at the New York Ship Building Co., Camden, N. J. The "Minnekahda" and "Minnelora," the two largest, which are building at Camden, will be uniform with the "Minnewaska" class in their general dimensions; length, 615 ft., 13,370 gross tonnage, and 10,000 h.p. The "Massachusetts" and "Mississippi" are smaller vessels, of 8,100 gross tons, 506 ft. long.

Another ship for the American-Hawaiian Steamship Co., the "Arizonian," is building at the Union Iron Works. She is to be a twin-screw, steel, cargo boat, 486 ft. long, and will cost \$850,000.

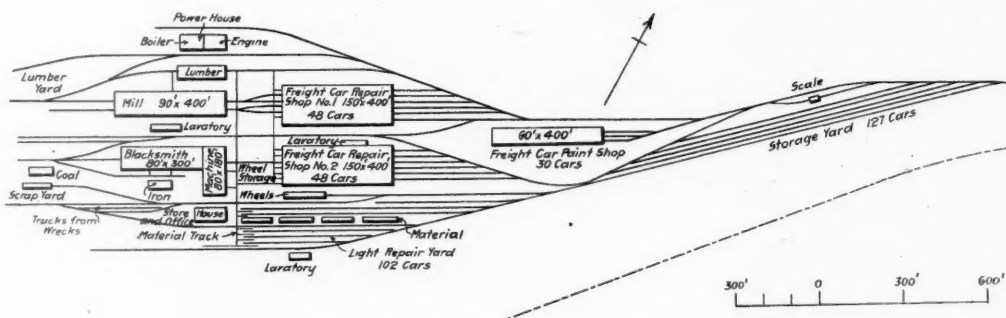
These nine vessels, of which six are for Atlantic ser-

vice and three for Pacific, are all modern in size and equipment, and will constitute an important addition to the fleet now engaged in foreign commerce under the American flag, which is now scarcely represented at all on the Atlantic, except by the six boats of the American Line.

New Car Shops of the Lackawanna at Scranton, Pa.

In our issue of Dec. 19, 1902, p. 968, we gave a short description of the new car shops to be built by the Delaware, Lackawanna & Western at Scranton, Pa. We are now able to give a plan of the general layout of the new plant and in a future issue we shall give some of the details of the buildings, etc.

The walls of all of the principal buildings will be constructed of vitrified paving brick laid in cement mortar and the foundations will be concrete. The roof trusses are to be steel and the purlins will be 6 in. x 12 in. yellow pine with 2 in. thick roof boards, except at the



General Layout—New Lackawanna Car Shops.

boiler and engine room, which will have steel purlins with concrete and expanded metal roofs.

The boiler capacity will be 1,250 h.p. and the electrical plant will have 1,000 h.p. of dynamos and generators.

The track scales will be on the tracks leading to the paint shop, so as to weigh cars before they are painted. There is also a storage yard near by that will accommodate 127 cars. This will be used in the daytime for storing defective cars, so as not to interfere with the operation of the plant. The lumber yard is to be placed so that the lumber has no backward movement passing from the yard to the mill, and from the mill to the repair shops, always moving in one direction.

The blacksmith shop will be equipped with the down draft forge system. The mill will be equipped with a series of exhaust fans, for the purpose of conveying shavings from all machines and deposit the same into the furnaces of the boilers. The buildings will be heated by the hot air fan system.

The machinery from the present plant will be transferred to the new plant and other new and modern machinery will be added to make the plant modern in all its appointments. The contract for the steel work of the entire plant has been let to the Fort Pitt Bridge Works. The entire plant will be erected by the Lackawanna. The grading has already been started, and all plans, etc., are ready and bills of material are now being made, all of which will be turned out in the company's present shops.

The Steel Corporation's Plan for Partnership and Profit-Sharing.

The Finance Committee of the United States Steel Corporation made public on Dec. 31 a plan for the sale of its preferred stock amongst its officers and employees and for a distribution of certain profits. Comment on the plan will be found on the editorial page. The circulars, as issued by the Chairman of the Committee, are printed below:

TO STOCKHOLDERS.

Enclosed you will find copy of a circular letter this day issued to the employees of the United States Steel Corporation and its subsidiary companies.

This circular sets forth two plans by which it is hoped to accomplish the following objects, viz:

First—To interest a large number of the employees of the Corporation and its subsidiary companies in becoming permanent stockholders.

Second—To engage on a profit-sharing basis the services of the presidents, officers, managers, superintendents and all others charged with responsibility in managing the affairs of the Corporation, thus making these men actual partners with you in the ownership and management of the Corporation.

At the time of the organization of the United States Steel Corporation, many of the subsidiary companies were managed, to a greater or less degree, by men who had a very large personal pecuniary interest in them, and naturally gave to the direction of the affairs of their companies a large part or all of their time.

The aim of the Steel Corporation has been to devise some plan by which to maintain this same important incentive, but in place of having it center, in comparatively few men, so to distribute its effect throughout the Corporation that every man, in his place, would feel that he had become a partner in the business and would work from that point of view.

A profit-sharing plan of some kind has seemed to be the only way of reaching this most desirable end, and since the Corporation was organized two years ago the Finance Committee has given much thought to the consideration of such a plan.

The plan now announced is one that has met with unani-

mous approval and it will be tried. After the test of use improvements can doubtless be suggested, and all such suggestions will be cordially welcomed and, if practicable, adopted.

One of the main purposes has been to devise some plan that with equal fairness would apply to every man, from the president of the Steel Corporation itself to the man with pick and shovel working for one of the subsidiary companies.

In addition it was desired to accomplish the following objects:

First—To interest the large number of young and able employees in the work of more closely organizing and systematizing the business in all its branches and ramifications, not only in connection with their own local concerns, but as an integral part of the Steel Corporation as an harmonious whole.

Second—To interest these men in reducing the general expenses as well as the particular cost of manufacture.

Third—To offer to these men an inducement to remain permanently in the Corporation's service.

Fourth—To avoid the tendency of a profit-sharing plan pertaining solely to a constituent company to build up the

profits of that company to the possible detriment of the broadest and best interests of the Corporation as an harmonious whole, and therefore to base the plan on the profits of the Corporation itself.

Fifth—To devise a plan by which, in the apportionment of money for the improvement and development of plants, Company A, for instance, would be interested in what Company B was doing, and Company B in what Company A was doing, constituting, as nearly as possible, automatic regulation against unnecessary duplication of appropriations.

The Finance Committee realizes that the accomplishment of all the above desirable results will severely test any one plan, and the plan recommended may fall short of our expectations. It has, however, been canvassed very carefully with the presidents of all the subsidiary companies, and it has met with their unanimous approval.

It is believed that at the very beginning the plan will interest a substantial number of the most thrifty men, and that eventually it will interest many of them.

It will be noted from the enclosed circular that of the stock which is offered for sale the workmen have been allowed to subscribe for a much larger amount than the officers can subscribe for. This is because at present it is impossible to devise a plan for sharing with the laboring men profits based on their daily wages; but it is believed that profits can be shared with these men based, so to speak, on stock held by them, and especially with such men as shall continue permanently in the Corporation's service. This plan will embrace a large body of men who have no part in the direct management of the Corporation's affairs, are not directly responsible for results, and are not able, in any direct way, to affect the cost of manufacture or the net profits as a whole, and yet, who, by their faithful service, are able to contribute much to the general gain of the Corporation and should be recognized in some substantial manner.

In round figures, it requires \$75,000,000 to pay the interest on the Corporation's bonds, dividends at the rate of 7 per cent. on its preferred stock, dividends at the rate of 4 per cent. on its common stock, and to make sinking fund deposits.

At this date there are about 55,000 stockholders. These stockholders, of course, own the vast properties of the United States Steel Corporation. It is believed that they and other possible investors in the Corporation's bonds and stocks would feel a special sense of security in the continued earning power of the Corporation if they knew that the officers and the managing men generally of the entire organization were willing to enter into a contract by which part of their compensation for services rendered shall be paid only after the realization of \$80,000,000 of profits; in other words, after interest on bonds, dividends on preferred and common stock, and sinking funds shall have been earned and paid or set aside.

It has been and still is intended, therefore, to make such an adjustment of salaries as shall seem proper in order that every man in the employ of the Corporation or of any of its subsidiary companies will feel that he is receiving a fair and reasonable compensation for his services, and that over and above such sum he shall have an opportunity each year to earn a substantial extra sum of money, provided he and his associates shall have been successful in earning for the stockholders a substantial surplus over and above interest, dividend and sinking fund charges. The basis of this is outlined in the accompanying circular.

In the matter of adjusting salaries, we have gone far enough to know that on and after Jan. 1, 1903, we will have in the employ of the Steel Corporation and of all of its subsidiary companies not to exceed twelve men with salaries of \$20,000 a year or over. This includes the salary of \$100,000 which is fixed as belonging to the office of president of the Corporation itself. There will be not to exceed fifty men who will receive from \$10,000 to \$20,000 a year. There will be about two hundred men who will receive from \$5,000 to \$10,000 a year, and something over 1,500 men who will receive from \$2,500 to \$5,000 a year.

We believe that the profit-sharing plan proposed in con-

nection with the men receiving these salaries will materially quicken the interest of a large number of our men in the general success of the Steel Corporation, and that it will retain them permanently in its service; that it will stimulate individual effort all along the lines, giving us an increasingly solid and compact organization working for one common end, and enabling us to get general support for all plans promising further economies in manufacture and in administration. In this way more than in any other not already adopted can we provide a guaranty of the continued success of the Corporation.

An immediate, important and far reaching result of thus welding together the men of all the subsidiary companies and of interesting them in working for one common object is obtained through the following important arrangement for making appropriations for maintenance, alterations and extensions of plants during the year 1903.

In the past, if any subsidiary company desired an appropriation for any purpose the president of the company made his recommendation to the officers of the Steel Corporation, who investigated it fully and referred it to the Executive Committee, which considered the matter from every point of view, and if approved passed it on to the Finance Committee for final action.

Now that we are to interest the presidents and the other officers of each subsidiary company in the profits of each of the other subsidiary companies, through a profit-sharing plan of the Steel Corporation as a whole, it will be found entirely practicable and highly advantageous to have the president of each subsidiary company give his opinion as to the advisability of a contemplated improvement or expenditure on any one of the plants, and to this end regularly to call the presidents of the subsidiary companies together as a manufacturing committee for conference. At such conferences all questions of contemplated expenditures and improvements on any plant will be discussed by the presidents of all the companies, and their recommendation will then go to the officers of the Steel Corporation and to the Executive Committee and ultimately to the Finance Committee.

In the same way questions of purchasing supplies, and other questions of common interest, will be taken up at these presidents' meetings and will be dealt with from the broad point of view of the success of the Steel Corporation as a whole. In short, the idea, as far as possible, is to administer the interests of the Steel Corporation by committee work, and to impress on every one in authority wherever possible and of advantage to the Corporation as a whole the importance of making such plant supplement, and co-operate with, every other plant of the United States Steel Corporation.

TO OFFICERS AND EMPLOYEES.

For several months the Finance Committee has been engaged in perfecting a plan which, in its opinion, would make it your common interest to become permanent holders of the preferred stock of the Corporation.

The Finance Committee has been endeavoring also to devise some comprehensive plan under which those of you who are charged with the responsibility of managing and directing the affairs of the Corporation, or of its several subsidiary companies, shall receive compensation partly on a profit-sharing basis.

The Committee has not been willing to adopt any system that shall not include every employee, from the president of the Corporation itself to the men working by the day in the several subsidiary companies.

A plan which, in the judgment of the Finance Committee, will accomplish these results, was submitted to the Board of Directors at its December meeting, and by unanimous vote the Finance Committee was authorized to proceed to perfect and to promulgate the plan. It is now submitted to you, in the hope and belief that it will receive from all of you the same hearty approval that was given to it by the presidents of the several subsidiary companies, who were freely consulted while the plan was being thought out and put into shape.

The plan is divided into two parts.

Part One.

From the earnings of the Corporation during the year 1902 there will have been set aside at least Two Million dollars, and as much more as is necessary, for the purchase of at least 25,000 shares of the Corporation's Preferred Stock for the purpose of making the following offer to all the employees of the Steel Corporation and of its subsidiary companies:

At the present time there are in the service of the Corporation and of its subsidiary companies, about 168,000 employees, whom we propose now to divide into six classes, as follows:

Class A will include all those who receive salaries of \$20,000 a year or over.

Class B will include all those who receive salaries of from \$10,000 to \$20,000 a year.

Class C will include all those who receive salaries of from \$5,000 to \$10,000 a year.

Class D will include all those who receive salaries of from \$2,500 to \$5,000 a year.

Class E will include all those who receive salaries of from \$800 to \$2,500 a year.

Class F will include all those who receive salaries of from \$800 a year or less.

During the month of January, 1903, the above-mentioned stock will be offered to any and every man in the employ of the Corporation, or any of its subsidiary companies, at the price of \$82.50 per share; subscriptions for this stock to be made on blanks obtainable at the office of the treasurer of any subsidiary company.

Every man can subscribe for as much stock as he chooses, not to exceed the sum represented by a certain percentage of his annual salary, as indicated in the following table:

Any man who belongs in Class A, as indicated in the preceding classification, will be allowed to subscribe for an amount of stock represented by a sum not to exceed 5 per cent. of his annual salary.

Class B, 8 per cent.

Class C, 10 per cent.

Class D, 12 per cent.

Class E, 15 per cent.

Class F, 20 per cent.

If, on this basis of subscription, more than 25,000 shares shall be subscribed for, 25,000 shares will be awarded to

the several subscribers in the order of the classes beginning with the lowest or Class F, the upper classes to receive only in case any stock shall remain untaken by the class below, and each class to receive ratably in the amount left for that class if there be not enough to satisfy the full subscription of that class, but each subscriber will be allotted at least one full share, even though this might make it necessary for the Finance Committee to purchase more than 25,000 shares.

Payment of the subscriptions for the stock must be made in monthly installments, to be deducted from the salary or wages of the subscriber, in such amounts as he may desire, not to exceed 25 per cent. of any one month's salary or wages.

A man may take as long as he chooses, not exceeding three years, to pay for his stock.

Dividends on the stock will go to the subscriber from the date on which he commences to make payments on account of his subscription.

Interest at 5 per cent. will be charged on deferred payments on the stock.

In case a man shall discontinue payments before his stock shall have been fully paid for, he can withdraw the money he has paid on account of principal and may keep the difference between the 5 per cent. interest he has paid and the 7 per cent. dividend he has received on the stock; and thereupon his subscription and all interest on the stock to which the same relates shall cease and determine.

As soon as the stock shall have been fully paid for, it will be issued in the name of the original subscriber and the certificate will be given to him, and he can then sell it any time he chooses. But as an inducement for him to keep it and to remain continuously in the employ of the Corporation or of one or another of the subsidiary companies, and to have the same interest in the business that a stockholder or working partner would have, the following offer is made, viz.:

If he will not sell or part with the stock, but will keep it and in January of each year, for five years, commencing with January, 1904, will exhibit the certificate to the treasurer of his company, together with a letter from a proper official to the effect that he has been continuously in the employ of the Corporation or of one or another of its subsidiary companies during the preceding year, and has shown a proper interest in its welfare and progress, he will during each of such five years receive checks at the rate of \$5 a share per year. For example: If a man buys one share of this stock in January, 1903, he will undertake to pay \$82.50 for it. If after paying for it he keeps it for five years he will in each year have received dividends at the rate of 7 per cent. on the par value of the stock, and also will have received each year an extra dividend, so to speak, of \$5; this latter sum being paid him as special compensation for rendering continuous faithful service to the Corporation or to one or another of its subsidiary companies, as shown by the exhibition of his certificate together with a letter from a proper official showing that he has worked to promote the best interests of the company in which he has thus become practically a partner.

If he shall remain continuously in the service of the Corporation or of one or another of its subsidiary companies for five years, at the end of the fifth year the Corporation intends that he shall receive a still further dividend, which cannot now be ascertained or stated, but which will be derived from the following source, viz.:

All who subscribe for stock in January, 1903, and commence to pay for it, but who discontinue at any time during the five years, of course will not receive the \$5 per share for such of the five years as remain after they discontinue. The Corporation will, however, pay into a special fund each year the \$5 payments that would have been made to such subscribers had they continued. This fund shall be credited with 5 per cent. annual interest, and at the end of the five years period the total amount thus accumulated will be divided into as many parts as shall be equal to the number of shares then remaining in the hands of men who shall have continued in such employ for the whole five years, and the Corporation will then by its own final determination award to each man whom it shall find deserving thereof as many parts of such accumulated fund as shall be equal to the number of shares then held by him under this plan:

Provided, however, that if a subscriber shall have died or shall have become disabled while faithfully serving the Corporation or one or another of its subsidiary companies, during such five years period, the money theretofore paid by him on account of the stock he was purchasing, or, if he has fully paid for it, the certificate of stock may be turned over by the Corporation to his estate or to him, together with a sum equal to \$5 per share for each of the five years not then expired.

If this plan shall be received favorably and shall meet with success, it is intended at the close of next year to make a similar offer, excepting, of course, that the price at which the stock then will be offered cannot be guaranteed now; it is, however, the intention to offer it at about the then market price, and in all other respects to make the terms of the offer similar to those now submitted.

The continuation of this policy would make it possible for a man to buy one or more shares of the stock each year under a contract with the Corporation upon terms offering a safer and more profitable investment than he could possibly find for his savings anywhere else.

Part Two.

During the year we have been and are now engaged in making changes and adjustments in the salaries of the men who occupy official and semi-official positions and who are engaged in directing and managing the affairs of the Corporation and of its several subsidiary companies in all the various branches of the departments of mining, manufacturing and transportation.

We have been making these changes preparatory to inaugurating, on Jan. 1, 1903, a plan by which all the men who are thus directly and indirectly charged with the responsibility of managing and operating these vast properties, will share with the stockholders in any profits made after a certain amount of annual net earnings shall have been reached, and to this end the following plan has been adopted.

In round figures it requires about \$75,000,000 to pay the interest on the bonds of the Corporation and of its several subsidiary companies, the dividends on the preferred and common stock, at the rates now being declared, and to make sinking fund deposits.

The Board of Directors has approved the recommendation of the Finance Committee to the effect that

Whenever \$80,000,000, and less than \$90,000,000, is earned during 1903, 1 per cent. shall be set aside;
Whenever \$90,000,000, and less than \$100,000,000 is earned during 1903, 1.2 per cent. shall be set aside;
Whenever \$100,000,000, and less than \$110,000,000, is earned during 1903, 1.4 per cent. shall be set aside;
Whenever \$110,000,000, and less than \$120,000,000, is earned during 1903, 1.6 per cent. shall be set aside;
Whenever \$120,000,000, and less than \$130,000,000, is earned during 1903, 1.8 per cent. shall be set aside;
Whenever \$130,000,000, and less than \$140,000,000, is earned during 1903, 2 per cent. shall be set aside;
Whenever \$140,000,000, and less than \$150,000,000, is earned during 1903, 2 1/4 per cent. shall be set aside;
Whenever \$150,000,000, and less than \$160,000,000, is earned during 1903, 2 1/2 per cent. shall be set aside.

It is intended that not only the Presidents, Officers, Managers and Superintendents shall share in these profits, but they shall be shared in as well by all other men charged with responsibility in managing the affairs of the Corporation, and the final selection of the men who shall share is to be made by the Finance Committee of the Steel Corporation.

The question of what constitutes profits and all other questions shall be determined solely and finally by the Finance Committee, and as this committee will have no interest whatsoever, directly or indirectly, in the profit-sharing plan, its rulings must be accepted by all as fair, impartial and conclusive.

We may not, in the first year, get an equitable apportionment, but it is not the intention to make permanent the above schedule or the apportionment of the same. The programme is hereby announced as the plan for the year 1903, and the Finance Committee reserves the right to modify any apportionment that is made at the end of each quarter during the year, and reserves the right to announce this or any other plan as a substitute for this, at the end of 1903 for the year 1904.

Any profits distributed under the above schedule and to the above classes of men will be paid out as follows, for example: If \$80,000,000 be earned during the year 1903, then \$800,000 would be the sum set aside for distribution. It is proposed to distribute one-half of this sum in cash quarterly during the year; reserve the other half until the end of the year; and then invest it in preferred stock; divide the amount of stock thus purchased, distributing one-half to the employees who are entitled to it, and holding the other half in the hands of the treasurer of the Corporation, giving each man a certificate for his interest, the certificate to recite among other things:

First. That if he remains continuously in the service of the Corporation or of one or another of its subsidiary companies for five years, the stock shall be delivered to him and he may do as he likes with it.

Second. That if he dies or becomes totally and permanently disabled while in the employ of the Corporation or of one or another of its subsidiary companies, the stock will be delivered to his estate or to him.

Third. That he can draw the dividends declared on the stock while it is held for his account and he remains in the employ of the Corporation or of one or another of its subsidiary companies.

Fourth. That if without previous consent voluntarily he shall have quitted the service of the Corporation or of its subsidiary companies, he shall forfeit all right to this stock, and in such case it will be held in a fund which at the end of five years will be divided among such employees as shall have complied with all the conditions.

Thus 25 per cent. of all the money set aside in this profit-sharing plan will be held for five years and will be given to such only as at the end of that period shall be in the employ of the Corporation or of one or another of its subsidiary companies from and since Jan. 1, 1903.

As the value of the interests of the United States Steel Corporation in the several subsidiary companies necessarily will be enhanced by everything that tends to increase their efficiency and earnings, this offer includes their employees as well as those of the Corporation itself.

Foreign Railroad Notes.

Penny-in-the-slot machines in German railroad stations have been condemned for working on Sunday by a superior court, after a lower court had found them legal. The legal question was whether the machines were of service in the operation of the railroads.

Herr Zemp, who has been President of the Swiss Confederate Council, after the expiration of his term of office will become (Jan. 1) chief of the Swiss Railroad Department.

In Siam it is intended to begin next April the construction of a railroad 220 miles long from Lop-Buri northwards to Utaradit. The only existing railroad in Siam was built by a German engineer.

A German traveler in describing the new 2 ft. gage railroad which was lately opened in German Southwest Africa from Swakopmund to Windhoek criticizes its crossing of the valley of the Khan River, which is wide with steep banks. The railroad descends with a grade of 132 ft. per mile for 2 1/2 miles to the river bed, and ascends on the other side with a grade of 264 ft. per mile for 1 1/4 miles. The little engines haul five loaded cars from the coast to the river, but can take only one up the further bank.

In November last the average daily work on the Simplan Tunnel was equivalent to an advance of 40 1/2 ft. daily. Just about 70 per cent. of the tunnel is now excavated. The flow of water at the south end has decreased, but it is still great.

Ton-Mile Statistics.

Mr. Acworth's lecture on railroad statistics, some notes of which appear in another column, called out some correspondence published in *The Times* in the matter of the statistics of the Indian railroads. Probably few of our readers ever see the reports of these railroads, but they have reached our office regularly for many years, and Sir Alexander Rendel is exactly right in his statement that it is the custom in India to report ton mile and passenger mile statistics. His letter is printed below. He is Consulting Engineer to the Secretary of State for India, etc.

"It may interest some of your readers to know that ton and passenger mileage statistics with the important points which they enable one to determine, i.e., average charges and costs per ton and per passenger mile and train loads—the vital statistics of railroads in fact—have been prepared and issued yearly for Indian railroads since the year 1870. They appeared at first in an appendix, prepared by me, to the annual report of the Government Director of Indian Railways to the Secretary of State for India, and latterly in the elaborate returns published annually in India by the Government of India. The East Indian Railway has received these returns from its audit office week by week, and has published half-yearly summaries of them in all their reports to their shareholders since 1874. Of their value to the Indian public, the Government of India, and the companies I think there can be no doubt. It is not too much to say that the present satisfactory condition of Indian railroads is very largely due to them, for to them India principally owes the low railroad rates she enjoys. They are not more than one-third those current in England. Having been the first to propose these statistics (during a visit to India in 1868), I naturally take some pleasure in the attention now being given them here. I do not pretend to originality in devising them. Of course, I did not get the idea of them from English practice, nor, I think, from America, where, I think, the plan had not in 1868 been adopted. My impression is that I took it from Continental practice, but my memory is hazy on that point. I ought to say that my suggestion was at once accepted by the Government of India, then represented by Colonel, now General Sir Richard Strachey, and Chairman of the East Indian Railway Company, to whom, in fact, is due the force which was necessary to get the necessary returns of traffic prepared in the railroad offices."

Concerning this letter Mr. Acworth says: "May I suggest to Sir Alexander Rendel that his memory is perhaps at fault when he says that though he does not know where he got the idea of the ton-mile statistics which he introduced into India, 'of course' he 'did not get it from English practice'? In early days many, if not most, of the English railroads kept and published ton-mile statistics; and though, probably, all the companies had already abandoned them when Parliament laid down in 1868 statutory forms of account from which they were omitted, their existence must still have been fresh in the memory of every railroad man in 1870, when Sir Alexander says he introduced them into India. Dr. Lardner's 'Railway Economy,' a well-known text-book of the last generation, is full of 'ton-miles.' Mr. Grierson in 1881 remembered and told the House of Commons Committee all about the Great Western Railway having kept ton-mile statistics, and why it gave up keeping them."

"Perhaps it would not be out of place to add that the Great Western may have been justified in abandoning the keeping of these statistics 40 or 50 years ago, and yet might be even better justified in reintroducing them today. Ton-mile statistics are needed for two purposes—to set out and justify to the public charges made, and to enable the officials to exercise economy and so reduce these charges still further. Neither of these objects was a question of practical politics half a century ago. But times are changed. The companies need every aid which science—statistical science among others—can give them, if they are to continue to render their present service to the public with even a moderate return to their shareholders. And traders need even better service and for less money, if they are to hold their own with their foreign rivals, who to-day are as well equipped as themselves. In this position of affairs it is surely impossible to believe that the successors of the great men who established our English railroad system will long continue to refuse to make use of an instrument which has been proved, not in India only, but all over the world, to be of prime utility in railroad management, and which was originally brought into use, like most other good things in the railroad world, by English managers on English railroads."

Mr. Hines on Government Regulations of Railroad Rates.

The main argument of Mr. Walker D. Hines, Vice-President of the Louisville and Nashville, in his address delivered at Philadelphia, Dec. 26, was given on page 12 last week. From the full text of the address we extract additional paragraphs as below. It has been printed in a pamphlet, and can doubtless be had by applying to Mr. Hines at Louisville. A footnote gives references to each of the 19 cases in which decisions of the Interstate Commerce Commission have been taken to the Courts. After stating that each of these cases

was decided against the Commission on the merits of the controversy, Mr. Hines goes on to say:

Since the decision of the Maximum Rate Case, in 1897, the Commission has made but one order which has been passed upon by the Supreme Court, that being the order relating to terminal charge on live stock shipments to Chicago. In that case the court clearly assumed that the Commission had the power to correct unreasonableness in rates. But it declined to enforce the order because the Commission's conclusion was illogical and unjust on the facts. (186 U. S. 320.)

Much has been said about the delays in court in enforcing the Commission's orders. Since, however, the Commission's orders, which have been taken to the courts, have been found almost without exception to be altogether improper, the length of time occupied by the courts in disposing of these cases is no criterion whatever as to the length of time which would be occupied by the courts in disposing of cases in which the Commission made just and proper orders. Indeed, orders of the latter description have been generally complied with by the carriers without any necessity for resort to the courts. The present law, moreover, plainly provides that unless the railroad company convinces the circuit court that the Commission's order is unlawful the circuit court shall decree the immediate observance of that order. While the carrier has the right to appeal, the appeal does not of itself relieve it of the necessity of observing the Commission's order thus approved by the circuit court, and it can secure such relief only by an affirmative order of the circuit court, which rests entirely in the discretion of that court; so that if the court believes the public welfare requires that the order shall immediately go into effect, the carrier must immediately observe it, whether it appeals or not.

All that is said as to securing just and reasonable rates necessarily relates to just and reasonable tariff rates. It is an entirely different thing to compel a strict observance of those rates. The tariff rates may be entirely proper and yet serious evils may arise from secret departures from them. This evil of secret rate-cutting was the most serious evil when the Interstate Commerce Act was passed, and has remained the most serious ever since. No possible power of rate-making can prevent secret rate-cutting. The incorrect impression has been disseminated by the Commission that secret rate-cutting was due to the Supreme Court's decision in the Maximum Rate Case, whereas in fact the two subjects have no relation to each other.

The regulation of railroads is eminently and exclusively a practical question, because no business is more severely practical or more inextricably interwoven with all the special and peculiar conditions of every phase of the commercial and industrial life of the country. The practical difficulties incident to the construction of railroad rates cannot be overestimated. Every article of commerce has its peculiar characteristics and develops its own peculiar conditions. Every source of supply for raw materials has its local peculiarities, and many of them must look to constantly shifting markets. Every plant for the manufacture of anything has its individual requirements. Every commercial center has its own individuality, made up of a variety of conditions affecting the sources of supply, markets of disposition, methods of transportation, and its own physical aspects. Every railroad has its own problems to meet, its own phenomena of supply and demand of cars and locomotives, its own difficulties as to grade and curvature, its own varying conditions as to the direction in which cars move empty and trains are lightest; its own problems of congestion, its own duties to industries and communities dependent upon it; and the whole of this differs for every railroad and for every season of the year, and on each railroad these conditions may vary on every division and at every terminal. Conceivably, if possible, of the continued but constantly varied interaction of all of these commercial, industrial, and transportation conditions and problems, and of numerous others impossible to enumerate, and some idea may be obtained of the forces which make railroad rates and of the complexities and difficulties of the subject.

More theorizing has been employed with respect to railroads than with respect to any other business in the country. It has been a favorite mistake to discuss at great length the reasons upon which the right to regulate might be founded and then to assume, without consideration, that the right thus established ought as a matter of fact to be exercised to the utmost extent at this time. Many of the arguments are of this character

alone. Yet if the right to regulate to the fullest conceivable extent be proved to a mathematical certainty, and if all the arguments and theories which ingenuity can suggest be marshaled to support it, all this will not and cannot advance a single step toward a decision of the practical question as to what regulation is necessary or desirable.

It is frequently urged that there ought to be more control over the railroads of the country. The fact is that the railroads now are more controlled than any other institutions in the country. They come in contact with the public in more different ways, and are more subject to injurious restrictions than any other property interests. Every village board of trustees, every town and city council, every school district and every State, and every political sub-division of the State, in some way regulates the railroad business and imposes restraints or taxes or both. The railroad is held to a more rigid responsibility in the courts than any other litigant. Its property is always within reach, and everything it does is done at its peril, not only of adverse judicial decisions to enforce legal rights that may have accrued against it, but of exciting hostile public sentiment which can hamper the property and impair its earning power in a thousand ways.

It is said that there should be some expert and impartial tribunal to decide between the two parties, the railroad on the one hand and the shipper on the other.



Bennett's Track Inspecting Apparatus—Inside the Car.

This is nothing but a misleading generality which does not assist in deciding the practical question at issue.

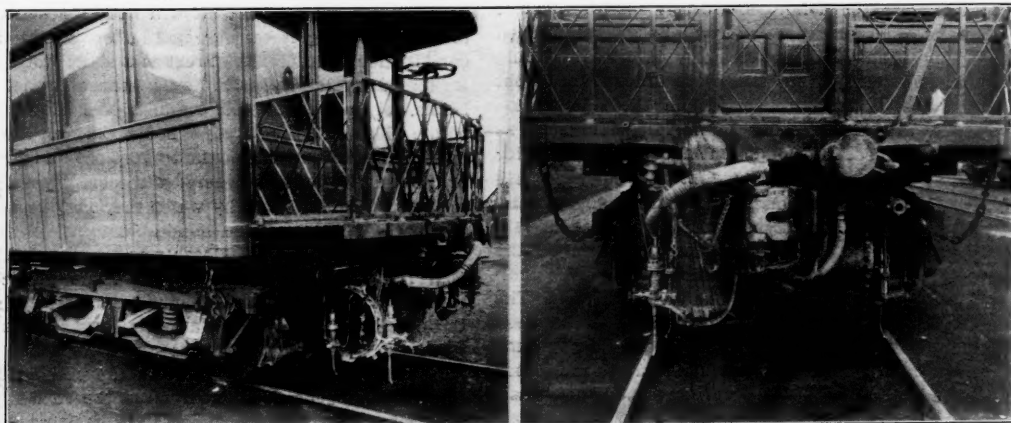
In repeated instances the Commission has utterly refused to be influenced by long-settled railroad usages, has unanimously pronounced them unsound and unlawful, and later, when the cases came before the courts of the United States, those usages have been upheld and commended. This cannot be due to any difference in personnel of the Commission and the courts. It must be due largely to the fact that the courts have no motive likely to approach these questions unhampered by preconceived and inelastic theories on the subject, and must be further due to the fact that the courts have no motive so to determine these questions as to draw to themselves the constant management of the details of the railroad business; whereas, the railroad commission is almost always largely influenced by this motive, for unless it can be managing the details of the railroad business it does not feel that it is justifying its existence.

It is everywhere recognized that administrative tribunals are ambitious for power. They use all they have and ask for more. The Interstate Commerce Commission is no exception to this rule. As an illustration of this disposition on the part of such tribunals, a State commission which has for many years fixed railroad rates recently came forward with the urgent recommendation that it be given the power to say when and where the railroads should build side-tracks, to compel them to acquire additional rolling stock, and to prescribe what disposition the railroads should make of their rolling stock. If any such Commission should be given all the power it asks it will eventually be operating the railroads in every detail, but clearly before the Government can properly operate the railroads of the country it ought to acquire and pay for them.

The very nature of the work of such a Commission prevents it from being strictly impartial. It does not occupy the attitude of a court, declaring what the law is and having no interest in the result, but it is constantly making new and sweeping laws as it goes along, and there is always serious danger of its being led on by the seductive fascination incident to this exercise of legislative power. Such a Commission therefore is apt to stand as the opponent of the railroads rather than as a tribunal deciding impartially between the shippers and the railroads. In my opinion the Interstate Commerce Commission is no exception to this general tendency, and

I think it can properly be regarded as the champion of the shipper rather than as an impartial tribunal. I think this conclusion is fully warranted by its decisions and other official utterances.

Railroad competition is not what has brought down rates in this country. It has been frequently very active and even acute, with the result that rates have been much reduced by secret rebates, but such illegitimate competition has been irregular and spasmodic in its effects. The low tariff rates which now prevail in this country are not due to this railroad competition, but are due to the competition between markets and between products, which will always exist, and to the efforts which the railroads are constantly making to increase their traffic, realizing, as they do, that increased profits must lie in increased volume of traffic, and that increased volume



Bennett's Track Inspection Car—Showing Spotting Tips.

can from time to time be developed by reductions in rates. In the territory south of the Ohio and east of the Mississippi River there has rarely if ever been any permanent and general reduction in tariff rates on account of mere railroad competition.

It has been picturesquely said that five men seated around a table in New York City can determine the rates which shall obtain in this country. The statement is without foundation. If a single individual owned all the railroads in the United States he could not dictate the rates of transportation. His motive would be to have his railroads managed so as to produce a profit upon his investment. The only practical way to accomplish this result would be to entrust the management of the lines in the various localities to officers familiar with the peculiar conditions of those sections, leaving it to them to develop such a volume of traffic as would make economical and profitable management possible. This condition could only be realized through an intelligent construction of rates on a basis sufficiently low to develop the traffic. This is what has made rates low in the past, and it will keep them low in the future.

While it is not probable that traffic conditions will permit the railroads of this country to increase their returns materially, it should be conceded, as an abstract proposition, that railroad companies have the right, in times of exceptional prosperity, when the price of every other service and commodity is increased, to share in that prosperity by increasing their rates. In other lines of business, the volume of business and the efficiency of machinery have increased, but this does not preclude an increased profit upon each unit of production. It will no doubt be said that with railroads the case is different, because the railroad business is a public service. Nevertheless the government of this country has in fact elected to permit the service to be performed by private enterprise and private capital. As long as private capital is subjected to all the risks and losses of adversity it certainly should not be denied participation in the advantages of prosperity, nor expected to rely for such advantages upon mere increase in volume of traffic. In times of depression, railroad traffic is not only much diminished in volume, but the railroads have to reduce their rates in order to retain even a diminished volume. Inasmuch as the government does not in any way restrict the railroad's losses, it should not restrict the railroad's profits, unless those profits are derived from unreasonable rates. To measure the reasonableness of the rates by some small rate of interest upon the investment is to adopt an impracticable rule and is to deny fair treatment to the private capital which has ventured to engage in business which the government itself is unwilling to perform, even assuming that the government has the constitutional power to perform it.

The power which the Interstate Commerce Commission could and would wield under the authority proposed is so great that it cannot be exaggerated. The Commission in the exercise of power to readjust rates between localities cannot help without hurting another. The opportunities for sectional favoritism which would thus arise, the local strife which would be engendered, and the serious interferences with the usual channels of commerce which would probably result are among the most serious consequences incident to giving the rate-making power to such a tribunal.

Graphic Record of Track Inspection.

The accompanying illustrations are reduced from a graphical record made in Bennett's electro-pneumatic mechanical track inspecting car, which is used by the Pennsylvania Lines West of Pittsburgh. The inspection apparatus furnishes a record of the number of joints on each rail that are three-eighths of an inch low, the number of joints on each rail that are one-fourth of an inch low, and the number of bad car swings per mile that are caused by the track being either out of line or cross level. The three-eighths inch joints are marked on the rail with a white spot, and the car swings with a yellow spot.

The graphical diagram as made by the pencils and by the observers gives a record of the alignment showing

No. 1 South Rail $\frac{3}{8}$ " Low Joint.					M.P. 16 - 60 85-30-1898
					Columbia Center
					M.P. 17-58 85-30-1898
					Pataskala
					M.P. 18-25 85-30-1898
					M.P. 19-35 85-30-1898
No. 2 North Rail $\frac{3}{8}$ " Low Joint.	Car Swings.		Gravel Ballast.		
					M.P. 20-48 85-30-1898
					M.P. 21-48 85-30-1898
					Kirkersville
					M.P. 22-44 85-30-1898
					2° Curve
					M.P. 23-40

Graphic Diagram of Track

M.P. 23 — 40 = Mile Post 23; 40 miles per hour; the notes of weight and age of rail are obvious.

SEPTEMBER 23, 24, 25, 26, 27, 1902.												
Total Readings			Average per Mile				Supervisors' Division		Superintendents' Division		Remarks.	
Super-Intendents' Division	Sub-div.	Length of Surv.	Water Spills.	% in. low.	Joints. No. 1.	Joints. 1/4 in. low. No. 4.	Car swings. No. 5.	General average.	Increase in per cent.	Decrease in per cent.		Relative standing.
Eastern Div.	G. W. Kittering	6	0	12	48	72	86	12	6.39	93.61	3.94	...
	A. H. Grace	20	6	33	330	340	128	122	4.41	95.59	...	...
	J. J. Wright	48	29	15	130	588	185	266	4.21	95.79	...	...
	P. J. Conlin	30	25	42	106	621	145	211	3.91	96.09	...	...
	J. J. McKenna	59	29	44	135	743	153	193	3.66	96.34	...	...
Western Div.	C. Shlennan	69	15	45	75	576	652	355	4.15	95.85	2.16	...
	R. R. Pett	62	7	64	440	525	595	235	3.71	96.29	...	...
	L. M. Berlin	62	69	356	1415	934	241	111	3.71	96.29	...	...
	W. W. Shnyder	62	45	197	258	1128	843	228	3.71	96.29	...	...
The Grade in per cent. is on the scale of 100 and is obtained by deducting 1 per cent for each unit in the General Average.												



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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.

The Grand Jury of Kings County, New York, has brought in a presentment against the Brooklyn Rapid Transit Company, the Brooklyn Heights Railroad Company, and other constituent companies. The Grand Jury recommends and urges that the Attorney-General institute an action to annul the charters of these companies and to strip them of their franchises. It further recommends that the municipality of New York acquire all the street, elevated and tunnel railroad systems now in use, or to be projected, and operate them itself for the benefit and the profit of the people of this city. After such sweeping recommendations the specific facts alleged are comparatively of minor importance. The Grand Jury says that the cars of the Brooklyn Rapid Transit Company are inadequately lighted and heated, and that not enough cars are run to serve the public. In these particulars it is found that the Brooklyn companies are "lamentable failures," and if they are permitted to go on in this way the result must be to lower the moral and physical tone of coming generations. We have no disposition to undertake a defence of the Brooklyn service, but we judge that a good deal of its inadequacy flows directly from too much municipal control already. The most striking failure to sufficiently accommodate the public is at the New York end of the Brooklyn bridge, and the Brooklyn Rapid Transit Company has been prevented from improving conditions there by the feebleness and defective intelligence of the various municipal officers and boards that control the situation. This one specific case is, for the present, a sufficient answer to the theoretical proposition of the Grand Jury that the service would be better if the whole transportation system of Greater New York were owned and worked by the city.

Last week the Railroad Commissioners of the State of New York issued an order designed to improve the service on the elevated railroads of New York City. The Board directs that all trains now run during the rush hours shall be kept in service from the beginning of the morning rush to midnight. It will be observed that the Commissioners say "all trains," not all cars. They direct further that during each of the months of January, February and March there shall be added to the service 100 cars of a specified seating capacity. Finally the Company shall take immediate steps to build a third

track on Third Avenue from Ninth street to Fifty-ninth, on Second Avenue from Canal street to One hundred and twenty-ninth street, on Ninth Avenue from Fourteenth street to Cortlandt street. The sagacity of this order will be apparent to anybody who reflects upon it a little. If it had been written by Mr. Skitt himself it could not have been better adapted to the policy and needs of the company. One of the objects in electrifying the road is that trains may be economically run all through the day on short headway; that is one of the advantages of electric service anywhere. The composition of the standard train for the Manhattan has been carefully studied out with special reference to this. The requirement that 100 additional cars shall be put in service each month for the next three months could be filled only by a miracle were it not for the fact that the orders for these additional cars were placed long ago and that the company is now receiving them. Obviously those cars were ordered to be put in service, and not to be put on the side tracks. Finally, the extension of the middle sidings so as to convert them into long, continuous third tracks for express service is exactly what the company has long wanted. Unfortunately the charter only permits the Manhattan Company to build a double-track railroad adapted to rapid transit service, with all the necessary sidings, switches, turnouts, etc. This charter does not permit them to build a third track. The difficulty in extending the third track has not been reluctance on the part of the company to pay damages to abutting property holders, but it has arisen from actual injunctions, which have had their basis in a wish to levy blackmail. The order of the Commissioners greatly strengthens the position of the Manhattan Company in case that company should seek additional legislation, or should undertake by other methods to extend its third track system. Everybody who has studied the matter knows that these additional third tracks are necessary for the service of the city, and for the full utilization of the property and franchise of the Manhattan Railway Company.

Friction Draft Gear.

It cannot be more than two years ago that the superintendent of motive power of a big railroad asked a supply man what there was "in it" for the *Railroad Gazette* in trying to push the friction draft gear. The question covered an unconscious acknowledgment of our intelligence coupled with some distrust of our motives. He could not understand how any one of practical mechanical sense could be honest in advocating a principle and a device so unpractical.

Since that time a great change has come about. Even the Bourbons have ceased to scoff and the inventors of friction draft gears are inventing overtime. At the meeting of the Railway Club of Pittsburgh the other day this subject was up, and there was no one present who raised a question as to the advisability and advantage of the use of the friction draft gear. The only questions that were brought forward seemed to be as to the capacity necessary in the contrivance, as to its ultimate life, and as to possibly simplifying the mechanism and reducing the number of parts. The superintendent of the Union Railroad said that he had some very heavy locomotive tenders which had been equipped with the friction gear about five years, and that it was giving as good service as when first put on. It so happens that the service with those engines is uncommonly heavy. The friction parts are brought into action practically every time they either push or pull, and much of that time the entire capacity of the gear is exhausted.

We doubt if our readers appreciate the number of these gears that have been put out. The Westinghouse Air Brake Company has shipped friction draft gears for upwards of 62,000 freight cars, about 2,000 locomotives and 300 passenger cars, and the company has on its books orders for equipment for over 10,000 cars. We regret that we have no figures from other makers of friction gear; but it would not be surprising if, within a few years, it would be as unusual for a high-class freight car to be built without friction draft gear as it is now to build one without the air-brake. The experience of the Butte, Anaconda & Pacific, records of which we have published twice in the last year, is practically repeated on other roads using the friction gear in heavy service, but we cannot get their records in such shape as to show them in the convincing way that the records of the B. A. & P. are shown.

The mechanical status of the device seems to be now highly satisfactory. Complaints of defects or

imperfections are seldom heard, and the gear seems to have taken its place as a reliable, standard, working apparatus.

One Way To Cure the Trusts.

The term "Trust" will probably take its place in our language with a new and definite meaning. We may resent its inaccuracy as a common name for any great aggregation of capital and combination of control; we may regret the unfavorable impression that the name immediately produces in many minds; we may agree that it has a proper and limited meaning and that as commonly used now its meaning is entirely arbitrary, conventional and irrational. But a new thing has come into our daily life, and that new thing needs a name. It will not be practicable to go on calling it an aggregation of capital or a combination of interests. Trust is a short word, and we may as well adopt it in its new sense and let the trusts, by years of good conduct, live down the odium that attaches to this noble old word when used in the new way. Let the trusts become trustees of the interests of the owners, of the employees, and of society and any name by which they may be called will become dignified and honorable.

This large sense of trusteeship is expressed in the plan for profit-sharing which was made public on New Year's day by the Finance Committee of the United States Steel Corporation. That plan is devised to enable and to induce the officers and employees to become stockholders in the corporation.

It is quite superfluous to remind the reader that very many profit-sharing plans have been tried and failed. The writer of these lines, when he was young and generous and employed a number of workmen, got up a beautiful plan which the men rejected without consideration, because it would have diminished the power of the labor leader or walking delegate to call a sudden and effective strike. Even the idea of getting the stock ownership distributed amongst the men is not new; the Illinois Central and the Great Northern, for example, have for some years been trying to get their stock into the hands of officers and employees. But the United States Steel plan is much more comprehensive than either of these, and it is worked out with skill and thoroughness so as to appeal to the humblest and the poorest employee as well as to the highest officer. It has been the aim "to devise some plan that with equal fairness would apply to every man, from the President of the Steel Corporation itself to the man with the pick and shovel working for one of the subsidiary companies."

There are in the employ of the Corporation and subsidiary companies about 168,000 employees. These will be divided into six classes, according to their pay. Class A includes all (about 12) who get \$20,000 a year or over, and Class F includes all who get \$800 a year or less. The other four classes are also rated by their yearly pay. Preferred stock to the amount of 25,000 shares has been bought out of earnings and allotted to the officers and employees at \$82.50 per share on subscription. The market price of this stock is now about 89.

But careful arrangements are made to prevent abuse of the privilege of subscription. The Class F man can subscribe for an amount not to exceed 20 per cent. of his yearly pay, while the Class A man can subscribe for but five per cent. The stock will be allotted first to the lowest class, and so on up, each class receiving stock only if the subscriptions of the classes below are filled; except that each subscriber will get one share even if more than 25,000 shares must be bought by the committee. The stock may be paid for any time within three years, the Corporation carrying it and charging five per cent. on arrears of payment. But the subscribers get the seven per cent. dividends from the dates when they begin payment. Thus, it will be seen, purchase of the stock is made easy for the poor man, and he has relatively more opportunity to buy than the man getting higher pay.

Beyond this, each owner of the stock will get a bonus or extra dividend of five dollars a share each January for five years if he can show that he has been continuously in the employ of the Corporation for the year preceding, and has shown a proper interest in its welfare and progress.

Finally, there will be a distribution of certain profits, in cash and stock, amongst presidents, officers, managing superintendents, and "all other men charged with responsibility in managing the affairs of the Corporation."

Such, very briefly, are the terms of this important plan. The precise terms may be read on another page. As a sociological episode it is almost as interesting as the organization of the United States Steel

Corporation itself, for it provides an opportunity to test, on a great scale, one possible way of correcting some of the weaknesses and evils of the trusts.

Those who have meditated much over the trust development, and have tried to discover the probable limit of that development, must have thought that the trust will break down at some stage by the destruction of the individual. Civilization as it stands to-day has been built up by the individual man fighting for his own hand. A boy has been apprenticed to a blacksmith. He has become a journeyman and a foreman, and then has gone out and borrowed a little money and put in his savings and started a machine shop. Little by little, he has gone on, through good times and bad times, through bankruptcy and recovery—working and saving, devising and inventing, looking around to enlarge his market and sitting up nights to think how he could cut down shop cost, but always fighting for his own business, even after he had become the head of a rich engine works or machine tool works. That is the story of modern life. It is not to be believed that a man working on salary, for a great impersonal corporation, will put into his work the unsparing zeal, the unflagging courage, the determination even to death, of this blacksmith's apprentice who was building up his own fortune in his own way. Very few men have the gift of a sense of duty which would impel them to kill themselves for the company. We understand the zeal and devotion with which many of the great corporations are served, for we see it constantly amongst our own friends and acquaintances; but human nature has not changed since Jacob diverted Laban's live stock to his own herds, and men continue to work best for themselves. The aim of the Finance Committee of the Steel Corporation is to make every man feel that he has "become a partner in the business and work from that point of view."

How effective will this plan of stock distribution and of profit-sharing be? Necessarily this will depend upon the number of officers and employees who take the stock, and upon the amount that each one takes. The distribution amongst the official classes must finally be important if the plan is carried on to the end which the Corporation now has in mind, for another distribution will be made next year if this one is successful, and this will doubtless be followed by still others. The holdings amongst the official classes will be effective in promoting economy, inventiveness and extension of the market.

But there is another aspect of this matter, hardly less important, which we have not considered at all yet. How will this distribution of stock act to diminish strikes and to raise the quality of the great mass of the employees? The two results—the partnership spirit and the improved stability and quality of the labor—are closely related, and we must keep them both in mind in speculating on the probable distribution of the stock.

Classes E and F, 166,000 men who receive less than \$2,500 a year, are for the most part laborers and their foremen and direct superintendents, and far the greater part of them are workmen. The extent to which they accept the company's offer is quite an exact measure of the influence it may exert in preventing strikes. By the terms these men have a minimum right to subscribe for 166,000 shares, six or seven times as many as the company has allotted for the whole proposition. No experienced man expects an early acceptance from any considerable proportion of these men. They are primarily suspicious, and the stubbornness of their suspicion is in inverse proportion to their intelligence, or, generally to their rate of pay. It will need time, years, to overcome that mental attitude of the laborer, buttressed by the walking delegate. Nevertheless, how can it fail to succeed, assuming the company's honest purpose and skill in making the proposition clear to simple minds?

The working man who subscribes for one share is allowed to make monthly payments extending over three years, paying 5 per cent. interest on his unpaid balances, receiving \$1.75 quarterly dividend, and also receiving \$5 at the end of each year. The concrete case is approximately as follows:

Monthly payments of \$2.30 each for one year.....	\$27.60
Five per cent. int. on aver. balances (paid quarterly) ..	3.44
	\$31.04
Less quarterly and annual dividends.....	12.00
	\$19.04
Net cost, first year.....	\$19.04
He may now sell share for \$82.50, less lien of \$54.90 =	27.60
and make a profit of.....	\$8.56

A similar calculation shows that the subscriber for one share may sell out at the end of his second year with a total profit of \$18.22, or at the end of the third year with a total profit of \$29.56. But there is the continual inducement to hold his share and stay in the service in the fact that he receives

so long as he stays interest on his savings at the rate of 14½ per cent., and also shares in the probably increasing market value of his stock. It seems quite clear that, assuming the stability of the United States Steel Corporation, there will be each year an increasing number of its laborers and foremen owning its shares, and under a forfeit of \$5 for each share owned for quitting work—for striking.

It is not too much to hope, it is possibly not too much to expect that this well-ordered profit-sharing proposition, on the largest scale ever known, may be the beginning of the solution of two great problems: the furnishing to ambitious young men of incentives as great and perhaps greater than those existing before trusts multiplied; and a powerful influence tending to prevent unjustifiable strikes.

An Extraordinary Engineering Contract.

For a good while it has been understood that Westinghouse, Church, Kerr & Co. would have the contract to equip the Pennsylvania tunnel across New York, the station on Manhattan Island and the terminal on Long Island. The newspapers now inform us that this contract has been made. So far, no official information has been given out, but a statement may be made any time. Meantime, we shall depart from our usual custom, and assume that the published version is substantially correct, inasmuch as the probabilities of its correctness are very strong.

As we understand the matter now, Westinghouse, Church, Kerr & Co. will take up the work in the tunnels after tracks are laid, and then complete the equipment. This will include the design and the construction of the power houses, the electrical distribution, the signaling, and everything that is necessary to put these tunnel lines into operation; but we do not understand that this firm has the contract for the car equipment.

We assume that the contract includes also certain important parts of the station and hotel on Manhattan Island. The architectural design of this work is in the hands of McKim, Mead & White, but as we understand the matter, the Westinghouse, Church, Kerr & Co. contract covers the design of the engineering and structural features of the station and also of the hotel. Then further, this contract covers the design and construction of all that belongs to the actual handling of trains in and through the station. It covers also all those facilities in the station and hotel which are necessary to their complete operation, as for instance, heating, lighting, ventilation, plumbing, water supply, elevators for passengers and baggage, pneumatic tube service, and in short everything that might be classed under engineering construction.

The terminal on Long Island will include not only the distribution of electricity for operating the trains, but a large signaling installation and electrical equipment for lighting. But the electric traction work does not end at this terminal, as an important part of the eastern end of the system on Long Island will be electrified, and we assume that this also is covered by the contract that we are considering.

We are not informed as to the arrangements for generating power, but we have understood that there are to be two great power houses, one in New Jersey and the other on Long Island, and naturally these power houses will be so related that one can supply current for the whole work for a short time in case of accident to the other.

It will be remembered that this company had a contract pretty nearly as comprehensive as this, for the building of the South Terminal Station, in Boston, and also for the Pittsburgh terminal of the Pittsburgh & Lake Erie, although in magnitude and in the variety of engineering those contracts were not nearly so great as the one now taken. The same company has within a few years carried out a number of contracts for the complete building and equipment of electric railroads, and also contracts for the equipment of factories and power houses.

This contract has a significance quite apart from its importance as a piece of business news, for it is an example of a sort of a movement which seems likely to go on and spread very widely in the next few years. The great group of Westinghouse Companies now makes up an organization for engineering work, much more complete, varied and comprehensive than anything that has heretofore existed. The variety of the product is such that pretty nearly everything for the carrying out of the contract for the Pennsylvania tunnel and station can be made in the various works of the Westinghouse Companies; but, obviously, this is only one side of the matter. Really, the most important fact is that the organization of this group of companies has become such that it supplies within itself the special knowledge, the range of experience and the administrative power to take up a great work like this, organize it and carry it through without any help from outside, and without any addition to its staff. We feel certain that there is no other organization in the world that could do this, but it is not at all unlikely that other organizations of this kind will speedily grow up in the years to come. It looks like one phase of the recent sociological movement in the direction of economy and efficiency through broad co-operation.

Annual Report.

Southern Pacific Company.—The annual report of this Company for the year ending 1902 was only issued a week or two ago, the long delay in its publication being due presumably in part to the great extent of the system, with an organization requiring the maintenance of many quasi-independent subsidiary corporations, each with its separate headquarters and accounts. These various controlled lines embrace a system of 9,052 miles of main track, besides 5,365 miles of river and ocean lines, an aggregate of transportation routes larger than that controlled and operated directly under its own organization by any other railroad company in the United States. With \$90,000,000 par value of the Company's outstanding capital stock of \$197,849,227 held by the Union Pacific, it might have been thought proper to withhold the Southern Pacific report until after the publication of that of the Union Pacific, which was only issued a few weeks ago. Whatever the reason for the long delay, it would be in itself sufficiently explained by the unusually comprehensive form of the report and the detailed statistics to be found in the document, covering a variety of information not usually accessible in railroad annual reports. For this, credit of course is to be given to the Comptroller—Mr. William Mahl, whose ability and energy in improving and systemizing railroad accounting are well known amongst railroad officers.

The present report shows a continuance of the heavy increase in Southern Pacific revenue and traffic which in a few years have quite completely altered the Company's position and at once made possible and necessary a great scheme of improvements which has been going on for several years, and is likely to continue for a considerable time yet, under plans already outlined and in process of execution. In the past fiscal year, operating an average of 8,757 miles of rail lines, an increase of about 100 miles over 1901, the Company reported gross transportation receipts of \$83,543,822, an increase of \$6,298,923. Allowing for various miscellaneous accounts, such as trackage and other rentals, land sales, interest on open accounts, etc., the Company's total receipts in the year were \$87,161,205—a gain of \$6,053,533, the total disbursements running up to \$76,619,734, leaving a balance of receipts over disbursements at \$10,541,473, a sum only \$298,624 more than in the previous year. More than this reported surplus was expended for betterments and new equipments, the total of this in the year running to \$11,536,348, including \$4,255,944 for new equipment, the cost of which will be later adjusted in the accounts of the Southern Pacific controlled lines. These total disbursements of \$76,619,734 included \$56,781,000 for operating expenses and taxes; \$14,757,476 for direct charges on funded debt; \$723,103 for special items such as betterments, advances and discounts on bonds sold, old accounts charged off, etc., and in addition \$812,500 for sinking fund charges, so that in 1902 the Company earned well above the reported surplus of \$10,542,000 without taking note of the fact that the sums charged to maintenance accounts, irrespective of improvement charges, increased abnormally, accounting for \$3,402,000, or 68 per cent. of the increase of \$4,920,000 in the operating expenses of the rail lines. The general income account of the Company is shown in the following summary:

	1902.	1901.	Increase.
Miles operated	8,757	8,655	102
Transportation earnings.....	\$83,543,822	\$77,244,898	\$6,298,924
Total gross earnings.....	87,161,205	81,107,672	6,053,533
Operating exp. & taxes.....	56,781,002	50,879,014	5,901,988
Net earnings.....	\$30,380,203	\$30,228,658	\$151,545
Interest on funded debt.....	14,757,376	14,425,241	332,135
Total charges.....	19,838,732	19,985,811	*147,079
Total disbursements.....	76,619,734	70,864,825	5,754,909
Net income.....	\$10,541,471	\$10,242,847	\$298,624
Betterments.....	6,763,958	2,922,271	3,841,687
New equipment.....	4,772,389	3,864,016	908,373
Tot. btrmnts. & equip.....	\$11,536,348	\$6,786,287	\$4,750,061

*Decrease.

The large increase in earnings shown above, the expansion in receipts and the heavy appropriations for improvements are alike noteworthy in the operations of the past year. Analysis of the increase in gross receipts of the rail lines, which amounted to \$5,431,084, brings out the interesting fact that the gain in passenger receipts, even without including mail and express earnings, exceeded the gain in freight revenues, amounting to 13½ per cent. as against 5 per cent. in freight earnings, although there was a loss of 3½ per cent. in the average passenger mile rate (excluding ferry and suburban traffic), while there was an increase of 2 per cent. in the ton mile rate. This growth of revenues was secured through an enlargement of 151¼ millions (16¼ per cent.) in passenger miles, and of nearly 95 millions in the freight ton miles, or 1.95 per cent. The earnings and expenses of all lines were as below:

	1902.	1901.	Increase.
Earnings—			
Freight	\$52,830,097	\$50,333,142	\$2,496,955
Passenger	21,709,226	19,109,605	2,599,621
Mails and express.....	3,013,072	2,799,020	214,052
Rentals & equip. mileage ..	1,371,325	1,250,870	120,455
Gross earnings.....	\$78,923,724	\$73,492,639	\$5,431,085
Expenses—			
Conducting transport'n.....	28,079,869	26,305,335	1,774,533
Maint. way & structures.....	12,093,242	10,174,319	1,918,922
Maint. of equipment.....	9,128,251	7,643,913	1,484,338
General expenses.....	1,699,781	1,957,161	*257,378
Operating expenses.....	\$51,001,146	\$46,080,731	\$4,920,415

*Decrease.

This expansion of passenger travel represents a factor

which the 1902 annual reports of the larger railroad companies shows to have been a factor of leading importance in maintaining and enlarging revenues the past year, seems to have been due, on the Southern Pacific, not only to the natural growth in local passenger business but to the material increase in through travel. It carried, for instance, a total of 29,314,000 passengers, a gain of 1,904,000, or 6.95 per cent. over 1901, but the increase in the number of through and local passengers carried one mile (exclusive of ferry and suburban traffic) was 140,533,000, or 17 1/2 per cent., and there was an increase of 8 1/2 miles, or over 12 per cent., in the average passenger journey of through and local passengers, although the other passenger travel reported (76 1/4 miles) is not in itself especially large. The growth in freight traffic was very largely attributable to expansion in coal and other mineral traffic, which altogether accounted for 19 1/2 per cent. of the total tons moved, as against 14.2 per cent. in 1901. The details of the traffic movement of the past year are shown in the following summary of traffic and mileage accounts:

	1902.	1901.	Increase.
Miles worked	8,758	8,655	103
Pass. loco. train miles ..	14,398,718	13,204,999	1,193,719
Thro & local pass. car'd ..	12,079,092	11,499,886	579,206
Ferry-suburban pass.	17,234,763	15,910,023	1,324,740
Pass. miles (thro & lcl.) ..	192,427,864	178,895,220	14,532,644
Pass. miles per mile	124.110	108.047	16.063
Aver. pass. mile revenue, etc. (thro & lcl.) ..	2.201	2.277	*.076
Aver. passenger journey (thro & local) ..	76.78	68.43	8.35
Freight loco. train miles ..	18,066,913	17,456,562	610,351
Total rev. train miles	33,707,055	32,230,266	1,476,789
Revenue tons moved	15,736,913	14,151,098	1,585,815
Ton-miles	4,957,602	4,862,692	94,910
Ton-miles per mile (all freight)	691.965	656.751	35.214
Load. freight car miles	334,874,988	327,689,395	7,185,593
Empty freight car miles	140,511,149	127,586,985	12,924,164
Aver. freight train load per rev. train mile	319	304	15
Freight car load (tons)	18	17 1/2	1/2
Ton-mile rev. (cts.)	1.021	1.001	.020
Earnings per revenue freight train mile	\$2.79	\$2.69	\$0.10
Ave. freight haul (miles) ..	299	319	*20

*Decrease.

With the increase of 151 1/4 millions, or 16 1/4 per cent., in the total passenger miles, and of 95 millions in the revenue ton mileage, there was an increase of 9 per cent. in locomotive miles run with passenger trains, and of 2 1/2 per cent. in locomotive miles run with freight trains, these figures being exclusive of light and helping locomotive mileage, as Mr. Mahl is careful to make very clear. The efforts of the officers to keep down the freight train mileage is not fully shown by even the small increase in revenue freight train mileage, as compared with the traffic moved, because of certain adverse elements in the movement of cars, probably attributable to a changed character in freight traffic movement. Thus there was an increase of nearly 10 per cent., or nearly 13 millions, in the empty car miles, as against an increase of only about 2 per cent., or a little over seven millions in loaded freight cars, the result of this being that the percentage of empty cars per train increased by 2 1/2 cars to 29.54 per cent. of the total cars per train. The total cost of conducting transportation per revenue train mile is reported as 83 1/2 cents, as against 81 1/2 cents in 1901, but including light, helping and switching mileage, the cost of transportation per locomotive mile in traffic service is reported as 59 1/2 cents, as against 58 1/4 cents in the previous year.

Although the aggregate increase in the cost of conducting transportation on the rail lines of \$1,774,500, or 6 1/4 per cent., over 1901, was thus relatively light compared with the growth of traffic movement, this item was considerably enhanced by the high prices paid for labor and material, and the report points out that a considerable part of the increase in all classes of operating expenses resulted from this same cause. Irrespective of this factor, however, the increase of 18 1/2 per cent. in the expenditure for maintenance of way and structures, and of nearly 19 1/2 per cent. in the cost of maintenance and equipment, aggregating \$3,403,000 for above accounts, obviously has permitted a very heavy increase in the amount of renewals, repairs and improvements, and a summary of the improvements carried out in the year and charged against operating expenses shows that over 560 miles of 80-lb. rails were laid down, cross ties were put in on the equivalent of 1,043 miles of track, and tie plates on the equivalent of over 779 miles, these rail renewals amounting to over 5 per cent., and the tie renewals to over 9 1/2 per cent. Over half of the exceptional increase of \$1,484,000, or 19 1/2 per cent. in maintenance of equipment cost is explained by the larger cost of locomotive repairs, this being \$806,000, or 27 1/4 per cent. more than in 1901. This item, however, included the present cost of 25 locomotives of the same capacity replaced; and about \$80,000 for changing locomotives to oil burners, 201 having been altered in the year, giving the Company a total of 311 fuel burning engines at the close of the year out of a total of 1,357 owned. The remaining increase is due to the larger locomotive mileage, 2,631,000 miles, or 5 1/2 per cent. more than in the previous year and also, and, as the report states, "to the greater amount of repairs required on the heavier type of locomotives now in use, and to the additional cost of making these repairs during periods when the traffic was so large as to require the almost constant use of every locomotive owned." That the statement in the report that "the rolling stock has been maintained in thoroughly good order" is amply justified is shown by the statistics of the condition of the equipments, the additions and replacements of the year, and to the fact

that including \$847,432 for replacing rolling stock disposed of, the repairs per locomotive and per car owned, were as follows in each of the last two years (Exhibit D):

	1902.	1901.
Locomotives	\$2,948	\$2,439
Baggage, express, mail and postal cars ..	788	825
Passenger cars	750	744
Freight cars	70	61

The expenditures for maintenance of way and structures averaged \$1,362 per mile main and second track, against \$1,161 in the preceding year, this cost being on a road whose traffic movement is measured by 692,000 ton miles per mile of road, and 124,000 passenger miles per mile of road, the second track amounting to only 120 miles in a total of approximately 8,700 miles operated. These charges for maintenance of way thus seem to be not only actually large but also exceedingly liberal, compared with the present traffic use of the property. The large increase is due to the amount of betterment work going on and the exceptionally large amounts of repairs and renewals which have been undertaken concurrently, and the cost of which is included in operating expenses. In reconstructing the Central Pacific Railway for one thing, while the rails, tie plates and fastenings, etc., have been charged to the reconstruction account, the cost of all labor and of cross ties replaced were charged directly to operating expenses.

Total capital expenditures in the year are reported as \$10,807,500, of which \$3,527,000 was for extensions, equipment of new lines and the terminals at Galveston, which cost \$1,075,000. This aggregate of \$10,807,500 was reduced, however, by certain credits to \$8,138,000, of which \$7,152,000 was paid for out of the earnings and the balance provided for by issuing of new bonds amounting to \$985,000.

The classification of the expenditure of \$7,280,400 for betterments and equipments is summarized below:

Expenditures for Betterments, Improvements and Equipment.	
Ballasting	\$780,719
Bridges, viaducts and culverts	341,652
Engine houses, shops, snow sheds, station buildings, signals and interlocking plants and other buildings	1,123,694
Cattle guards, crossings, fencing, filling in timber trestles, right of way, real estate and telegraph line	544,404
147.78 miles of sidings and 12.23 miles of second track	1,155,095
Reconstruction, change of line and revisions of grades and alignment	2,818,391
8 baggage, mail and express, 4 passenger, 230 freight cars, etc., and shop machinery (\$133,298) ..	516,445
Total	\$7,280,400

The extent of the improvement work carried on in the year is not only indicated by the total of the expenditures, and the details of the work, but by the amount of transportation service called for. There were 4,524,000 tons of company freight hauled, an increase of 865,200 (23 1/2 per cent.), as against an increase of 1,585,800 in the tons of revenue freight, the free tonnage being nearly a total of the commercial tons. The construction material was moved a total of 1,102,300,000 ton miles, or 280,800,000 ton miles (34 per cent.) more than in 1901, while the gain in revenue freight ton mileage was only 95 millions to a total of about 4,958 millions.

The estimates of the Russian Minister of Transportation for new lines and capital expenditures on old ones in 1903 call for about \$87,000,000, which is \$5,000,000 more than the year before. The line in progress from Orenburg to Tashkend will require about \$7,000,000. This line is to be completed by July, 1905. The largest requirement is for a new railroad from St. Petersburg nearly due eastward, passing far to the north of Moscow, for which more than \$26,000,000 is needed in 1903. About an equal amount will be required to build the railroad around the south end of Lake Baikal, to unite the already completed sections of the Siberian Railroad, though it will be only 160 miles long; \$5,000,000 was required for it in 1902, and twice as much is asked for 1903. One of the new lines provided for is a branch to the Persian border. The new lines attract most attention, but the most important work in Russia is improvements to increase the capacity of the old lines in European Russia, which at times suffer greatly from the inability of the railroads to carry promptly the freight brought to their stations. Since the last harvest millions of bushels of grain, it is said, have accumulated at stations, mostly piled on the ground, without protection against the weather.

The Association of Motive Power Officers of the Vanderbilt Lines.

Owing to the extent of the Vanderbilt lines it has become necessary that an agreement be reached regarding a standard for cars and locomotives. The Association of Motive Power Officers of the Vanderbilt lines which has recently been organized has taken up a number of questions and has already adopted the following standards:

- The height of coach platforms is to be 50 in. from the top of the rail to the top of the platform and 51 in. on baggage cars. The difference between coach and baggage cars was provided to allow for the greater possible load in the latter class of cars. The maximum distance between the top of the rail and the center of the coupler shank is 34 and 35 in. for coach and baggage cars respectively. It has also recommended the removal of air-brake hose on all equipment after a service of

three years. The responsibility for this change is equally divided among the companies interested. Any hose that has been in service for more than three years may be removed from any car owned by any of the lines by either of the several companies interested and a bill rendered for the new hose against the company owning the car.

The companies interested own about 3,600 locomotives, about 3,600 passenger cars, and about 150,000 freight and miscellaneous cars. Mr. F. M. Whyte, Mechanical Engineer of the New York Central, is Secretary of the Association.

City Transportation in Chicago.

On the 19th day of last July, the City of Chicago made an agreement with Mr. B. J. Arnold to report on the whole matter of local transportation within the limits of the city, so far as regards engineering and operating matters. On the 19th of November Mr. Arnold handed in his report, which appears now in one octavo volume of 310 pages of text besides plates and a portfolio of maps. It was a big job for a very busy man to do in four months, but it illustrates the well-known fact that the busier a man is the more time he can find for an odd job.

From Mr. Arnold's letter of transmittal we get a view of what he had in mind in preparing this report. He has not considered questions of municipal policy concerning which there may be differences of opinion, except where they are clearly engineering or transportation questions. He has not considered the franchise policy of the city. He has endeavored to provide plans for a comprehensive system of street railways. He has considered many novel plans as, of course, everybody is bound to do who takes up this subject in any city. But, after careful study of the situation, and becoming adequately informed as to the great number of passengers who must be handled in and out of the business district in very short periods of time, he has decided to consider nothing that may be thought in any way experimental, and has brought forward a comprehensive system involving combinations of methods that are already thoroughly tried out. He suggests that some day it may be advisable to adopt in Chicago some plans for super-surface structures, but probably that will not be until the capacity of the systems recommended in his report is exhausted.

In the preparation of the report the sensible idea has been adopted of starting out with a summary of conclusions and recommendations, and the first conclusion is that, with respect to transportation, Chicago should be considered as one city, not as three. Street car passengers should be carried over the most direct route between any two points, for one fare. This can be best brought about by complete unification of ownership and management.

The through route principle should be general. Routes through the business district should be substituted for terminals and outside the business district the best results will follow from connecting detached lines and running through service.

A system of subways should be built to accommodate street car traffic and to relieve surface congestion in the business district. Galleries should be provided for underground utilities. Two subway plans are outlined in the report.

It is not thought advisable to try to lower the present river tunnels and at the same time keep them for surface railroad use, for the reason that the approaches would be made unreasonably long or the grades unreasonably great. It is recommended, therefore, that the tops of the tunnels be promptly removed, leaving the lower parts of one, or perhaps two, for utilizing later.

A plan is presented for a unified, combined surface and subway street railway system, comprising the lines of the City Railway Co., The Union Traction Co., The Chicago General Railway Co., The Chicago Consolidated Traction Co., and new lines necessary to connect them. The total single-track mileage would be about 745 millions, and its estimated cost is about 70 million dollars. Adding 20 million dollars for additional subways in the business district, the new system complete would cost about 90 million dollars.

Plans are presented for re-routing surface terminals in the business district. Immediate improvement may be effected by substituting electric for cable power, and by routing cars according to the plans outlined, all cars from the West and North to enter the business district over bridges until subways are constructed.

Electric underground conduits should be put in and overhead trolley construction prohibited within the area bounded by Twelfth street on the South and the River on the North and West. Outside of this district the objections to the overhead trolley are aesthetic, and it is for the city authorities to say how much should be spent to satisfy that consideration.

The population of Chicago is increasing at the rate of 7.7 per cent. per year. For nine years the revenue passengers carried on surface and elevated lines have increased at the rate of five per cent. per annum, compounded, and the increase on the surface lines during that period has been at the rate of 1.5 per cent. per year, compounded. But for seven years, to include 1901, the increase has been at the rate of 6.3 per cent. per year, compounded; for the surface lines alone at the rate of 3.9 per cent. per year, compounded; and for the

elevated lines in the same period the increase has been 26 per cent. per year, compounded. The population of Chicago has increased faster than that of any other city in the world. It is not assumed that this rate will continue, but curves prepared from the statistics gathered give a reasonable basis of estimate of future traffic and earnings.

It is estimated that to reproduce complete certain existing properties with new construction and equipment would cost about 66 million dollars.

Finally, a special recommendation is devoted to the Union Loop. Here the limiting factor should be at the junction points. At present, it is at the platform stations. It is recommended that the platforms be lengthened, so that two trains can load and unload at the station at the same time. When the capacity of the junction points is reached the facilities can be increased by building stub end terminals just outside the loop. The ideal solution of the elevated loop problem would be to utilize the loop structure as sections of through routes between the different sections of the city.

It is quite impracticable for us to go further into this important report now. The various parts cover a general discussion of the street railway system, and the conditions governing them; the inadequacy of present terminals and service; the growth of population and development of traffic; the subject of through routes and universal transfers; the subject of a reorganized and unified system of street railways and, finally, technical problems and estimates covering subways, conduits, the Union Loop, rails and track construction, etc., etc. The description of details is valuable, the analysis is admirable and there is much in the recommendations that applies (in principle) to other cities. Probably the report can be had by addressing Mr. Arnold, Transit Building, New York, or Marquette Building, Chicago.

Improvements on the Central Pacific.

In the annual report of the Southern Pacific Company to June 30, appears the following statement of work doing or being done on the Central Pacific. The table is in itself so complete that no comment is necessary.

Location.	Length of line, miles.		Max. grade, feet per mile compensated.		Max. curvature, degrees.		Total angle, degrees.		Total curvature, Miles.		P. c. of work done to June 30, 1902.	
	To build.	Distance saved.	Pres. ent.	New.	Pres. ent.	New.	Pres. ent.	New.	Pres. ent.	New.	Pres. ent.	New.
East Reno to Vista.....	4.95	1.27	48.05	21.12	5	1/2	193	36	1.39	1.37	22.3	27.6
Vista to east of Wadsworth.....	29.16	1.91	63.36	21.12	10	4	2,122	733	14.08	10.28	45.3	35.2
East of Wadsworth to Brown.....	49.63	8.23	84.48	21.12	5	1 1/2	1,181	313	16.40	7.89	39.6	15.9
Orena Change.....	0.00	0.25	52.80	21.12	8	1	344	120	5.19	3.93	48.7	37.8
Cosgrove Change.....	0.00	0.05	52.80	21.12	1 1/2	7/12	37	35	1.91	1.30	24.6	16.6
Rose Creek Change.....	0.00	0.00	52.80	21.12	1 1/2	3/4	38	38	1.43	1.30	75.2	68.2
Winnemucca Change.....	0.00	0.08	52.80	21.12	2 1/2	1/2	77	13	0.70	0.49	34.0	24.7
Golconda to Stone House.....	25.31	1.60	66.00	21.12	9 1/2	2 1/2	1,115	235	10.03	4.05	37.3	16.0
Battle Mountain to Argenta.....	9.61	1.51	26.06	11.62	1	1	134	74	4.55	2.59	41.8	26.9
Argenta Sec. House to Beowawe.....	14.62	0.49	49.63	21.12	7 1/4	4	587	149	6.82	2.87	45.1	19.6
Beowawe to east of Cluro.....	7.35	0.29	51.74	21.12	6	1 3/4	187	92	3.67	1.44	48.0	19.6
East of Cluro to Gerald.....	1.31	0.14	50.69	21.12	10	3	243	106	0.69	0.88	47.6	67.4
Change opposite Gerald.....	0.94	0.11	21.12	21.12	6 1/4	3	183	77	0.74	0.75	70.4	79.6
Gerald to Palsade (3 changes).....	4.97	0.22	52.80	21.12	10	4	851	317	2.86	1.98	55.1	39.8
Between Palsade and Carlin.....	2.22	0.18	52.80	21.12	8	1	376	25	1.57	0.72	65.2	32.5
East of Carlin to Moleen.....	6.53	1.75	52.80	21.12	9 9/10	2 1/2	1,341	140	5.03	2.76	60.8	42.3
Osino to Elburz (Peko).....	6.40	2.92	52.80	21.12	8	2 1/2	1,126	74	7.13	1.46	76.5	22.8
Moor to Toano.....	26.95	0.26	79.70	21.12	8	4	2,097	1,108	12.18	8.67	44.8	32.2
Lucin to Ogden.....	104.36	41.71	89.76	21.12	10	3	4,260	462	35.16	8.73	24.1	8.4
	294.31	46.41	.....	.....	.....	.....	16,492	4,147	.....	.....	.....	.....

The Taff Vale Strike Verdict.

This very important suit for damages in connection with the strike which occurred in August, 1900, on the Taff Vale Railway has ended in a verdict for the railway company against each and all of the three defendants (as reported in the *Railroad Gazette* Jan. 2, page 15)—viz.: the Amalgamated Society of Railway Servants, Mr. R. Bell, M.P. (its general secretary), and Mr. Holmes (the organizing secretary for the South Wales district). The amount of the damages to be awarded was not submitted to the jury, but is to be assessed by the judge at the next sittings of the Court. The company's claim is alternatively £27,000 or £28,000. An appeal, if lodged, can only be on points of law. The defendants cannot escape from the fact that a jury of their fellow countrymen has found them guilty of a conspiracy to bring about the commitment of illegalities, such as persuading men to break their contracts, and by acts of violence and otherwise intimidating other men who either were, or intended to be, engaged to take the place of those who had gone out on strike. It is fair to add that the conduct of Mr. Holmes was considered by the judge to have been far more deserving of censure and penalty than that of Mr. Bell; but Mr. Bell could not, and has not, escaped liability for allowing himself to be involved in the illegalities committed, though many of these were obviously done against his better judgment.

It is obvious that this verdict must have the effect of greatly limiting, if not destroying, the powers for evil of the Amalgamated Society, and, indeed, of all other trades unions. In the case of a strike, the most dangerous weapon of the agitator consists in suddenness of action. If a large body of men be withdrawn at a day's, or even a few days', notice, a railroad company is placed in a very difficult position as regards the working of its traffic. But, such sudden withdrawal involves breach of contract of service, for which, according to this decision, the trade union or the agitator concerned is liable, if they or he support the action of the men. They are further liable for a great many, if not all, of those measures which are commonly employed against those loyal and independent workers who are known in times of strikes as "black-

legs." Consequently, it is very difficult to see how, in future, the Amalgamated Society or any other association of railroad men are to organize a successful strike without afterwards being mulcted in very heavy damages, in addition to the onerous cost of the "movement" itself.

This is a most satisfactory outcome of a long and very arduous series of actions pursued, in the face of a good deal of discouragement, by the Taff Vale Railway Company. To the directors and officers of that company, and particularly to Mr. Beasley, the General Manager, the thanks of the railroad world, and, indeed, of the whole industrial community, are due for demonstrating the righteous powers which the law of England gives to employers of labor in resisting the mischievous, and often malicious, efforts of professional agitators, and ill-regulated trade unions.

Mr. Justice Willis, in summing up, said:

"Could they imagine any excuse for the kind of persuasion that was used? The blackleg circular was an instance, and to his mind the word blackleg was always regarded by workmen as a word of terror. Was there a word of disapproval by the society except in a very general sense of the acts done by the pickets, or a single instance in which a man had been reprimanded for his part in such acts? He had looked in vain for them. In his opinion there could be no doubt that there was concerted action by the defendants to further the strike, which involved breaches of contract by some of the men, and which they knew would lead to exactly the sort of consequences that resulted. He wished it to be thoroughly understood that it was his view that if persons helped one another by some general machinery to carry out unlawful acts by which other people were damaged, and for which there was no excuse, it did not matter a bit what special department each took. It was no excuse to say they were the servants of the executive. They were engaged together in unlawful transactions. In the course of law and justice realities must be dealt with and not shams."—*The Railway News, London.*

Wages.

The increase of wages on the Delaware, Lackawanna & Western, announced several weeks ago, went into effect Jan. 1. Officers of the road report the aggregate in-

hoods and the officers of the Union Pacific, which have been held within the past two weeks, are still without decisive result. The chief or only obstacle to a settlement is said to be the demand for the abolition of piecework. Further conferences are to be held at Omaha, as each side to the controversy has made claims which the other side believed could not be substantiated. President Burt holds that of the 3,000 men who are on strike the majority really are in favor of piecework. On the general subject of the Union Pacific strike the *Evening Post* (New York) of Jan. 3 says:

The prospect of a settlement of the labor difficulties of the Union Pacific and Southern Pacific railroads, through agreements made this week between E. H. Harriman and the labor leaders, has revived interest in the railroad labor question. The troubles of these transcontinental officers with their machinists have for some time been the danger-point in the railroad labor situation. The Union Pacific trouble began as long ago as June 17. While the men have demanded more wages now, the real reason for their strike of last June was well understood to be the fact that President Burt gave orders that they should be paid by piece work instead of per hour or day. A delegation was sent to the President's office to protest. When they returned to their places, it was asserted, they were discharged. This forced the strike, and during the summer high barbed-wire fences were built around the company's shops to protect imported labor. New men deserted, however, and much of the road's equipment was actually put out of use.

Mr. Harriman brought the matter to a crisis himself when he tried to supply necessary engines to the Union Pacific from the allied Southern Pacific lines. The men had expected this, and from being a strike among the 1,500 machinists against the establishment of a piecework plan of wage payment, the trouble spread in sympathy to all the other unions of skilled labor on the Southern Pacific, Oregon Short Line, and Oregon Railroad and Navigation Company's lines. Engineers refused to haul Southern Pacific engines through the Ogden gateway. An engine of the St. Paul road, of a type which the Union Pacific wished to order was started over the line on trial. It was not allowed to pass beyond Omaha. Finally when the machinists had so successfully tied up traffic that freight for the Pacific Coast in many instances was nearly a month late, a general order was issued two weeks ago by the heads of union labor on all of the Harriman systems to strike in sympathy Jan. 4, unless the demands of the shopmen were met. Then the company yielded.

Notwithstanding the generally aggressive spirit of labor, this year, it is to be observed that in the railroad field there have been practically only two small strikes besides that mentioned above, although there have been hundreds of conferences which have settled wage questions amicably. The Chicago freight handlers went out in July, and in October the switchmen in the same territory had a short strike, neither becoming very alarming in character. There has been so little violence, that with all the picketing at Omaha of the Union Pacific shops, and the endeavors during six consecutive months to persuade imported labor to join the ranks of the strikers, only one life was sacrificed. The blame for even this was not proven against the persons accused and tried.

Probably there has never been a time during four or five years of prosperity just past when railroad labor in one part of the country or another has not been trying to have wages advanced. Gradual increases have been made without much stir from time to time. . . . The impression created by the Pennsylvania's proclamation in October, together with the popular feeling that the coal miners had been successful, caused labor delegations to become very active suddenly, and prompt in calling on officials all over the country, not only in the railroad field, but in every other line, asking for more pay.

TECHNICAL.

Manufacturing and Business.

The Mann-McCann Co., Chicago, reports orders from the Missouri, Kansas & Texas and Western Indiana Railroads for the McCann grader and ballast spreader.

The Mexican Central has contracted with Pittsburgh Spring & Steel Co., through their General Agent, Thornton N. Motley, for all requirements of engine and car springs during the year 1903.

The Rex Drop Forged Twist Drill Co., of Whitestone, L. I., has been incorporated in New York State with \$100,000 capital, by J. J. McNeil, J. E. Prendeville and H. S. Harvey, all of Whitestone.

Henry C. Meyer, Jr., M.E., announces the removal of his office from 21 Park Row, to 114 Liberty street, New York, where he will practice his profession as Consulting Mechanical Engineer, making a specialty of the design of steam power plants and the mechanical equipment of buildings.

The name of the Southern Car & Foundry Co., which has been absorbed by the Standard Steel Car Co., is to be discontinued and hereafter known as the Standard Steel Car Co. As already mentioned in these columns, many improvements are to be made, particularly at Aniston, Ala.

During the past year the Vulcan Iron Works Co. sold all of its "Giant" steam shovels just as fast as they could be built. Orders are booked far into 1903. The demand

for steam shovels during 1902 exceeded that of any previous year. The company's shops are now undergoing extensive additions to accommodate the increase of business.

In the suit of the former owners of the Berlin Iron Bridge Company against the American Bridge Co., a Connecticut Court has decided in favor of the Berlin Bridge Co., with judgment for over \$30,000, and interest, which is allowed on the appraisal of contracts on hand when the Berlin Company was absorbed by the American Bridge Co.

The Falls Hollow Staybolt Company, of Cuyahoga Falls, Ohio, report that their sales of both solid and hollow staybolt iron during the year 1902 are the largest in the history of the company; and they are cheerful prophets for the year 1903. The Republic Railway Appliance Co., of St. Louis, have been appointed Southwestern agents for their product.

William Perkins Tyler, President of the Tyler Tube & Pipe Co., of Washington, Pa., died in New York City Dec. 27. Mr. Tyler was the founder of the Tyler Tube & Pipe Co., and devoted the last 12 years of his life to the development of the business. The former associates of Mr. Tyler will carry on the business along lines similar to those inaugurated by Mr. Tyler.

The Crane Company, of Chicago, has increased its capital stock from \$5,000,000 to \$7,000,000. The company makes wrought pipe and over 7,000 different articles in the way of fittings and other supplies for gas, steam and hot water service. It is said that more than 3,500 men and boys are employed in the Chicago plant and the branches in San Francisco, New York, St. Louis, Kansas City, etc. Richard T. Crane is President.

J. Grant MacGregor, Chief Draughtsman, Cincinnati, Hamilton & Dayton Ry., has resigned to go into private practice. Mr. MacGregor has been with the C. H. & D. since February, 1900. Previously he was with the Canadian Pacific and Great Northern Railroads. He began his career in Scotland in 1880, serving five years at civil engineering work, and five years with the Caledonian Railway, first as Assistant Engineer and later as Division Engineer.

Robert W. Hunt & Co. have the inspection of 350 steel ore cars, to be built by the Pressed Steel Car Co. for the Duluth, Mesaba & Northern, and 450 of the same class of cars, to be built by the same company for the Duluth & Iron Range. In addition, for the latter railroad company, they have a small order of 75 flat and box cars to be built at Hegewisch, Ill. They also have the inspection of 500 steel underframe box cars, to be built at Berwick, Pa., for the Philadelphia & Reading, and 500 steel hopper coal cars for the same road, to be built at Butler, Pa. Further, they have the inspection of 1,600 box and 500 stock cars, with pressed steel underframes, to be built at Hegewisch, Ill., for the Southern Pacific, and 1,000 flats, with pressed steel underframes, to be built for the same company by the Pressed Steel Car Co., at its McKee's Rocks plant. They are engaged upon the inspection of 300 gondola cars for the Bellington & Beaver Creek R. R., at Jeffersonville, Ind., and 110 coal cars for the East St. Louis & Suburban R. R., to be built at Madison, Ill. The firm has just received instructions to inspect 27 locomotives at the Baldwin Locomotive Works, for the Wheeling & Lake Erie, and an additional order by the Hocking Valley for the inspection of 12 switching engines, to be built at the Brooks Works.

Iron and Steel.

The Maryland Construction Co., of Wilmington, Del., has been incorporated. It will build railroads, bridges, etc.

Frank M. Wilmot, of Trenton, N. J., heretofore Assistant Superintendent of the Carnegie Steel Co., has been appointed Superintendent.

The Continental Bridge Co., of Chicago, has been formed with a nominal capital of \$2,500, by G. F. Hoag, Harry Rogers and C. I. Hines.

Rowland J. O'Neil, who for the past year managed the plant of the Parkersburg Iron & Steel Co., died at Parkersburg, W. Va., last week.

The Chicago Heights Malleable Iron Co., with office at Chicago Heights, Ill., has been formed with \$50,000 capital by W. E. Canedy, John H. Hood and A. W. McElowney.

All the pipe to be used on the grounds of the National Exposition Co., at St. Louis, will be furnished by the National Tube Company, of McKeesport, Pa.; over 100 miles of it to be used for gas and water systems.

Despatches from Pittsburgh announce that the \$20,000,000 malleable castings consolidation, announced last month as an assured thing, has gone to pieces. It is said that the principal support for the financing of the deal was withdrawn.

The Mount Royal Foundry Co. has been incorporated at Ottawa, Ont., with a capital of \$45,000 and headquarters in Montreal, Que. The promoters are Messrs. Robert Dunn, Thomas Monahan, Arthur J. Darling, John Cavanagh and others, of Montreal.

Over 27,000,000 tons of ore came down through the Great Lakes during the year 1902, of which 16,000,000 tons belonged to the United States Steel Corporation. Of this amount 9,500,000 tons was carried in the corporation's own ships, and 6,500,000 tons was carried in chartered ships.

In its review of the year *Dun's Review* says the condi-

tion of this industry is still considered a safe barometer of general business, and despite the serious interruption of fuel scarcity, the year 1902 must be considered by far the most prosperous ever experienced, while the outlook for 1903 is still brighter. After the contracts had been placed during the first few months, quotations became almost nominal owing to the utter impossibility of making prompt deliveries. Pig iron was much the most violently advanced as to price, and large premiums were readily paid by consumers who needed the material. Bessemer list prices rose from \$16.90 to \$22, and foundry iron was even more sharply advanced. It is not possible to approximate the extent to which the coke famine caused the strength, but obviously there would have been less inflation had furnaces been able to offer supplies freely. At no time was there any accumulation, notwithstanding the fact that all but two of the 12 months opened with an active blast furnace capacity exceeding all records in preceding years. The top point was 352,064 tons weekly on May 1, and the intervention of the coal strike was all that prevented much higher records being attained. With the fuel problem solved there is a certainty of new records in 1903.

The Bridge Shops at Mount Clare.

The bridge work of the Baltimore & Ohio Railroad that is now done at Mount Clare will be removed to Martinsburg. The shops which are now occupied by the Bridge Department at Mount Clare will be used for pattern storage and for the extension of the Test Department laboratory.

Bids for Two Armored Cruisers.

Bids for building two armored cruisers—the "Tennessee" and the "Washington"—were opened at the Navy Department at Washington, Jan. 6. These vessels are to be the most powerful of their class in the world. All the bids were within the limit of cost fixed by Congress, \$4,650,000 for each vessel. The bids submitted were as follows:

The Newport News Shipbuilding & Dry Dock Co., Department's plans, one vessel, \$4,325,000, to be completed in 42 months; Fore River Ship & Engine Co., Weymouth, Mass., one vessel, Department's plans, \$4,578,000, 42 months; Bath Iron Works, Bath, Me., one vessel, Department's plans, \$4,500,000, 42 months; Union Iron Works, San Francisco, one vessel, Department's plans, \$4,365,000, 42 months; New York Shipbuilding Co., one vessel, Department's plans, \$4,250,000, 42 months; two vessels, Department's plans, \$4,150,000 each, in 40 and 42 months respectively; two vessels, bidder's plans, \$4,280,000 for each; Moran Bros. Co., Seattle, Wash., one vessel, Department's plans, \$4,397,000, 42 months; William Cramp & Sons, Philadelphia, one vessel, Department's plans, \$4,200,000, 39 months; one vessel, bidder's plans, \$4,100,000, 36 months, or \$4,000,000 each for two vessels, in 36 and 39 months, respectively; one vessel on Department's plans, but to be fitted with turbine boilers, \$4,100,000, or two vessels with turbine boilers at \$4,000,000 each.

Cramps offered to build one or both vessels with turbine engines. In a letter submitted with their bids, it was declared that they had satisfied themselves that 25,000 horse power would be required to drive the two armored cruisers at a speed of 21.5 knots, the minimum required by the specifications. The horse power fixed by the Navy Department to develop this speed was 23,000.

Pittsburgh Structural Steel Company.

A number of business men interested in the iron and structural business in and about Pittsburgh, have formed a new company to be known as the Pittsburgh Structural Steel Co., which is to at once build a plant with the expectation of having it ready for operation by July 1. It is the intention of this new company to engage principally in structural work, making no effort to do bridge work. The following have been elected to the Board of Directors: C. A. Ralph, J. F. Joyce, Geo. W. Miller, P. H. B. Shidle and Geo. V. Milliken.

To Build Locomotives in Canada.

It is said that some 80 acres of land have already been bought for the site of the proposed locomotive works to be built on Longue Point in Montreal, Canada. M. J. Haney, of Toronto, is the President of this company, which will be known as the Locomotive & Machine Works of Montreal, and which was incorporated some weeks since. The Vice-President is T. T. Davis, of Montreal, and the Managing Director, G. P. Brophy, of Ottawa. The company is capitalized at \$1,000,000, but is not offering its stock for sale. The President is interested in the Kingston Locomotive Works.

Test of Lighting Systems.

Three methods of acetylene gas lighting are to be tested on the Western Maryland. At present the Bryan and Adams & Westlake systems are in use, and the Commercial system is also to be tried.

Acetylene Car Lighting.

The acetylene gas department of the Pyle-National Electric Headlight Co., Chicago, has been moved from the Monadnock Building to 26 Custom House Place. As is known, this company has the general agency in the United States, Canada and Mexico for the system of the Commercial Acetylene Co. In the new quarters a 50-ft. passenger car body has been built and equipped with the various kinds of deck and wall lamps used with the system. Such a car can be satisfactorily lighted with five deck lamps using 1 ft. of gas per hour each, or 5 ft. per hour total. As the measured candle power of lamps

having burners of this capacity ($\frac{1}{2}$ ft. per hour) is at the rate of 49.06 c. p. per cu. ft. of gas burned, it will be seen that a total illumination of 245.3 c.p. is obtained. Cars for several different roads have been equipped with the system.

American Car & Foundry.

On Tuesday of this week the directors of the American Car & Foundry Company declared a quarterly dividend of 1 per cent. on the common stock, thus putting that stock on a 4 per cent. basis. The quarterly dividend of $1\frac{1}{4}$ per cent. on the preferred was also declared. The approximate net earnings for the quarter ending May 30 were \$2,160,000.

The United States Steel Corporation's Year.

A regular meeting of the directors of the United States Steel Corporation was held on Tuesday, and Mr. H. C. Frick and Mr. Robert Bacon were added to the Finance Committee, the number of this committee having been increased for that purpose. It will be remembered that Mr. Bacon recently withdrew from Messrs. John P. Morgan & Co. in order to try to recover his health. The Board sanctioned the purchase of the Troy furnaces and works on Breaker Island and also of the Union Steel and Sharon Steel Works, and approved the plan for distribution of stock ownership and dividend profits, as described elsewhere in this issue. The earnings for the last quarter of the year were \$31,340,000, an increase of about \$1,600,000 over the last quarter of 1901. The total net earnings for the year (estimating December) amounted to \$132,663,000, after deducting maintenance and fixed charges of the subsidiary companies. From this sum 24 millions were deducted for depreciation and reserve and $18\frac{1}{4}$ millions for interest on the United States Steel Corporation bonds and sinking fund on the same. The balance left after dividends and reserve is \$89,894,000, from which \$56,053,000 is paid in dividends on the preferred at 7 per cent., and the common at 4 per cent., the balance being applicable to increase the depreciation and reserve fund for new construction, etc.

Washington Filtration Plant.

Brig. Gen. Gillespie, Chief of Engineers U. S. A., has approved the new plans and specifications prepared by Col. A. M. Miller, Corps of Engineers, U. S. A., in charge of the Washington Aqueduct, assisted by Mr. Allen Hazen, for the construction of a filtration plant for Washington on the site already selected. Bids have been advertised for and will be opened at Col. Miller's office on Jan. 28, and it is expected that active work on the plant will be begun by March 1 next.

Another Destroyer.

The torpedo boat destroyer "Perry," built by the Union Iron Works of San Francisco, was formally accepted by the Navy Department on Dec. 31.

THE SCRAP HEAP.

Notes.

The Louisville Car Association has reduced the free time on soft coal, grain and produce from 72 hours to 48 hours.

The Philadelphia & Reading now requires employees in the train and station service to carry standard watches. Employees whose present watches are unsatisfactory may buy new ones through the company for \$35, payable in installments of \$4 a month.

The New York, New Haven & Hartford has discontinued the special low freight rates which have been in effect by the Providence Line steamers for a year or two past; the effect is to increase rates from 30 per cent. to 50 per cent. on many important commodities.

The Baltimore & Ohio on Dec. 31 announced that "until further notice we cannot accept carload freight except live stock and perishable products, for points east of Pittsburgh, Moundsville and Parkersburg. We will continue to accept our own empty cars and empty foreign cars en route home." It was expected that the embargo thus established might last a week.

The number of cars dealt with by the various demurrage associations of the country during the three months ending Sept. 30, 1902, was 1,331,523 greater than during the corresponding period of the previous year. The number in 1902 was 6,231,827; in 1901 it was 4,908,304. This great increase is partly due, though probably not very largely, to the inclusion in 1902 of cities and towns at which demurrage was not collected in 1901.

Consul General J. P. Bray reports to the Government from Melbourne, under date of Nov. 4, that the Pacific cable from Australia to London has been completed. The sections are as follows: Vancouver to Fanning Island, 3,240 knots; Vancouver Island to Fiji, 2,093 knots; Fiji to Norfolk Island, 961 knots; Norfolk Island to Brisbane, 843 knots; Norfolk Island to New Zealand, 537 knots, a total of 7,665 knots, or about 8,830 miles.

The pension department of the Philadelphia & Reading Railway, the establishment of which was announced last spring (*Railroad Gazette*, May 30, 1902, p. 396), went into operation Jan. 1. It is said that about 200 men will at once be retired. The directors have appropriated \$75,000 for the first year, and reserve the right to reduce the rate at which pensions are paid, if the number of persons eligible should more than exhaust this sum.

Suit has been begun by the Michigan Central Railroad Company in the Circuit Court for the County of Wayne against the State of Michigan for \$6,000,000 damages on account of the repeal of its special charter. It is

alleged that by the reduction of its passenger fares to 2 cents per mile, the increase of its taxes, and by other means the company has been damaged in this amount. The estimate is based upon the experience of the company during the past year when it has been operating under the general railroad law, which required reductions in rates.

The State Railroad Commission of South Carolina has decided in favor of the railroad company on the complaint of certain business men of Charleston that in the movement of cotton the Southern Railway has discriminated against that city and in favor of Norfolk. The prosecution attempted to show that the Southern refused to route cotton through Charleston for export and the commission quoted from a witness for the prosecution that the Southern had always respected the wish of the shipper and had routed all freight via Charleston, when so specified.

Ship Building in the United Kingdom During 1902.

The *New York Commercial* prints a summary of ship building returns in the United Kingdom for 1902, which shows that 823 vessels were launched, aggregating 1,451,995 gross tons, as against 672 vessels aggregating 1,671,798 gross tons in 1901, and 717 vessels of 1,505,605 gross tons in 1900. The present gross tonnage is the smallest since 1897. The heaviest output for both years was by Harland & Wolff, who built 79,497 gross tons in 1902, and 93,316 gross tons in 1901. The next heaviest output for the current year was by C. S. Swan & Hunter, who built 64,220 tons. Tonnage was reported launched in 107 yards. It is stated that there is at present no demand for new cargo steamships of the "tramp" variety, the reason presumably being that the present policy of building large carriers has thrown on the market a number of smaller vessels comparatively recently built and in good condition.

Purdue University.

Mr. L. V. Ludy has been appointed to have temporary charge of the Department of Analytical and Applied Mechanics at Purdue University.

Mr. Ludy graduated in Mechanical Engineering with the class of 1898. He has been active in every department of the laboratory, and when it became necessary to transfer the air-brake testing rack of the Master Car Builders' Association from the shops of the Pennsylvania Railroad to Purdue, Mr. Ludy was selected to have charge of the work. He went to Altoona to see the whole dismantled and loaded, and upon its arrival at Purdue he supervised its erection.

Another Russian Asiatic Railroad.

United States Commercial Agent R. T. Greener reports to the Government from Vladivostok that the Russian Ministry of Ways & Communications has decided to build a standard gage railroad to connect the Soochan coal mines with Vladivostok. By rail the cost per poond (36 lbs.) will not exceed six cents. The Russian Pacific squadron uses Sakhalin coal at 15.4 cents per poond, delivered, but this coal contains much sulphur. The Soochan coal is said to be of excellent quality. The estimated cost of the road is \$309,000, and it is thought it can be completed within a year. The length of the line to be built is not reported.

Rules for Passengers.

The following rules are said to have been adopted by a new street railroad company in Cardiff, Wales:

Thou shalt not use cuss words or swear,
Or play sweet music on the air,
Or give out tracts or ask for alms,
Give way to cards or such like charms,
When drunk thou shalt in nowise ride;
No dog or beast shall with thee bide.
Thou shalt not cut or scratch thy name,
Defile the car, deface the same,
Thou shalt not smoke, thou shalt not spit,
No antics, mind, but merely sit.
Don't try to boss or interfere,
Or show the driver how to steer.
Just sit you down and take your rest—
The men must know their business best,
And keep your hands off curious things,
The trolley rope, the bell that rings.
Upon or off a moving car
Thou shalt not jump, so friend, beware.
Nor carry gun or dangerous thing,
Nor with disease that risk may bring.
Pay up, nor grumble at the fare,
Before you quit or leave the car.
Such is the law, don't say it nay;
There's fines for those who don't obey!

The Landslide at Storm King Mountain.

Press reports under date of Dec. 22 stated that hundreds of tons of rock and earth fell from the side of Storm King Mountain near Cornwall, N. Y., completely covering the tracks of the West Shore R. R., and causing serious delay. An officer writes that the incident as published was greatly overdrawn. One track was cleared in about 4½ hours, and the other in 12 hours. About half a dozen rails were damaged.

Moving a Burning Coal Pile.

After the Illinois Central's coal pile at Gwinne, Miss., had been on fire two months, and after ineffectual attempts to put it out, it was decided to move the coal. Fifteen thousand tons were taken out in nine days with steam shovels of the "Giant" boom type, with a hose playing on the coal to keep it cool. Even with this precaution, several cars were set on fire. This is thought to be the first time that a steam shovel has ever been used for such a purpose.

Electric Light in Railroad Building.

In building the cut-off to connect the Pecos Valley line with its main line in New Mexico, the Atchison, Topeka & Santa Fe will install a large electric light plant at the mouth of the Abo Pass Canyon so as to work night and day.

Christmas Traffic in England.

This year the Christmas traffic has been very heavy, in every case showing a great increase over that of the previous year. One of the chief features is the increase in the parcels traffic. The traffic has so increased that numerous special parcel trains have been run this year by most of the leading lines.

The Wanstead Collision.

The Coroner's Jury which investigated the butting collision that occurred at Wanstead, Ont., Dec. 26 (*Rail-*

road Gazette, Jan. 2, p. 15), in which 28 lives were lost, brought in a verdict as follows: "We find that Arthur W. Ricketts was killed in the collision at Wanstead on the evening of Friday, Dec. 26, 1902. That said collision was caused by wrong orders being given No. 5 at Watford. Responsibility for the issuance of wrong orders we are not agreed upon as between Operator Carson and Dispatcher Kerr. That after No. 5 had left Watford by the issuance of wrong orders, we consider that the accident could have been averted by the operator at Watford or King's Court Junction had the railroad company had more experienced operators at these points (one being but a boy of 16), at each of which places the dispatcher, having had ample time to do it, endeavored to get the opposing trains stopped."

James Troyer, the night operator at King's Court Junction, where the dispatcher endeavored to stop the express train, is a boy of 16 years. He stated that he was on duty for the first time on the night of the accident, and that his total previous experience as an operator was for two nights at Strathney, where he received only a total of four messages. He gave as a reason for not hearing Kerr calling him for seven or eight minutes, that he was studying the time-table, and did not recognize the office call, which he had heard only once before.

Examinations for Civil Engineers.

To fill three vacancies in the list of civil engineers in the Navy, Rear Admiral Endicott, Chief of the Bureau of Yards and Docks, has arranged with the Civil Service Commission to hold competitive examinations of candidates at New York and Chicago on Feb. 16 next.

Through Sleeping Car—Chicago to the "Soo."

The Chicago & North Western now runs sleeping cars through between Chicago and Sault Ste. Marie without change, the only line between these points. The new service is via Milwaukee to Larch, Mich., the junction point with the Minneapolis, St. Paul & Sault Ste. Marie, and over the latter to Sault Ste. Marie. The car leaves Chicago at 8 p.m. daily except Sunday, arriving at the Soo at 10:20 next morning. Returning it leaves the Soo at 3 p.m., reaching Chicago at 7:30 a.m.

A Chance For Railroad Contractors in Australia.

The South Australian Parliament passed on Nov. 13, 1902, an act providing for a railroad to be built from Oodnadatta, in the State of South Australia, to Pine Creek, in the Northern Territory. This will involve about 1,063 miles of single track line, 3 ft. 6 in. gage, laid with 60-lb. rails, and will bridge the gap in central Australia between the two present railheads, Oodnadatta and Pine Creek, completing a trans-continental connection between Adelaide and Port Darwin. The act provides that an alternative route may be agreed upon but that the length of the line shall in no case exceed 1,200 miles. The Commissioner of Railways is to call for tenders by advertisement in the "Government Gazette," and in the public newspapers of Australia, Great Britain, America, France and Germany, before Feb. 13, 1903, and these tenders shall be forwarded to the Commissioner at Adelaide not later than 18 months from the date of the passing of the bill. The specifications to be furnished by the Commissioner will give further particulars as to what is to be contained in the tenders.

Decision Against the Wabash.

The Supreme Court of Pennsylvania on Jan. 5 reversed the decision of the Allegheny County Court of Common Pleas. Under the decision of the lower court, the Pittsburgh, Carnegie & Western, acting for the Wabash, had entered Pittsburgh without obtaining the consent of the Pittsburgh Councils, and contracts involving large sums have been let. As the situation now stands, work must be suspended until a franchise ordinance is passed by the Councils.

Some Stock for Mr. Schwab.

Announcement is made that Chas. M. Schwab has cabled that he wishes to subscribe for the maximum number of preferred shares which he is permitted to have under the new stock subscription plan, described elsewhere in our columns. President Schwab, who receives \$100,000 per year as salary, is rated in Class A, and is entitled to subscribe for an amount equal to 5 per cent. of his salary, or about 60 shares at \$82.50.

Profit Sharing at the Pressed Steel Car Works.

In connection with the announcement of the United States Steel Corporation of its plan for going into partnership with its employees by a system enabling them to purchase stock at special rates, the plan just announced by the Pressed Steel Car Co. is of particular interest. It was approved by the directors last November, and was put into effect on Dec. 20. The company will carry for each of its employees who has been in the service six months and whose application is approved by the General Manager, from one to twenty-five shares of preferred stock, according to the wages or salary of the employee. Five per cent. on the stock must be paid at the outset, followed by monthly payments of the same amount. Interest on the deferred payments will be charged at 4 per cent., which leaves an advantage of 3 per cent. to the employees, as the stock now pays 7 per cent. Official statement is made that whether an employee does or does not take advantage of the offer his action will not affect his standing with the management.

LOCOMOTIVE BUILDING.

The Boston & Maine is reported to have placed an order for 20 locomotives with the Baldwin Locomotive Works.

The Texas & Pacific has ordered 15 ten-wheel simple freight locomotives from the American Locomotive Co.

The Copper Range is having three locomotives built at the Schenectady Works of the American Locomotive Co.

The Pittsburgh, Chartiers & Youghiopheny is having one locomotive built at the Cooke Works of the American Locomotive Co.

The Baldwin Locomotive Works is building one locomotive for each of the following companies: Millwood Coal & Coke and El Paso & Southwestern.

The Temiskaming & Northern Ontario Railway Commission wants two second-hand locomotives weighing not less than 60 tons, as advertised in the *Railroad Gazette*.

CAR BUILDING.

The Pullman Car Co. is building 20 coaches for its own general service.

The Pere Marquette has ordered 2,000 cars from the American Car & Foundry Co.

The Duluth & Iron Range is having 450 ore cars built by the Pressed Steel Car Co.

The Missouri Pacific has ordered 1,000 coal cars from the American Car & Foundry Co.

The Eureka & Klamath River is having 40 freights built at the South Baltimore Car Works.

The Boyne City & Southwestern (Michigan) is having 10 freights built at the Russell Wheel & Foundry Co.

The Chicago, Milwaukee & St. Paul is having two coaches built by Barney & Smith, in addition to the two noted in our issue of Dec. 26.

The Southern Pacific has ordered 25 coaches from Barney & Smith. It is building 30 standard 60-ft. baggage cars at its own shops at Sacramento, Cal.

The St. Louis & San Francisco is reported to be about to order from 10 to 30 coaches, three to six chair, three combination mail and baggage and one cafe car from the American Car & Foundry Co.

The Philadelphia & Reading is having 500 steel under-frame box cars built at the Berwick Works of the American Car & Foundry Co., and 500 steel hopper coal cars at the Standard Steel Car Company's Works at Butler, Pa.

The New York, New Haven & Hartford is having 51 coaches built at the Wason Mfg. Co., Springfield, Mass.; 15 at the Wilmington Works of the American Car & Foundry Co., and 50 by Osgood Bradley & Sons, Worcester, Mass.

The Illinois Central has ordered 1,000 box cars from the American Car & Foundry Co. and 500 coal cars from the Southern Car & Foundry Co., in addition to the 2,000 coal cars ordered from the American Car & Foundry Co., and reported in our issue of Jan. 2. They are also reported to be going to place orders for more cars.

The Terre Haute & Indianapolis (Vandalia), as reported in our issue of Jan. 2, has ordered 200 steel coal cars of 100,000 lbs. capacity from the American Car & Foundry Co. The cars will be 38 ft. 2½ in. long, 9 ft. 3¼ in. wide, and 3 ft. 9 in. high, all inside measurements, with metal underframes. The special equipment includes: Pennsylvania R. R. specification axles, cast steel bolsters, National-Hollow brake-beams, Westinghouse air-brakes, Pennsylvania R. R. specification brasses, Tower couplers, M. C. B. standard journal boxes, Protectus paint, Pennsylvania R. R. specification springs, and American Car & Foundry Co.'s wheels.

The Atlanta & West Point will order 75 box cars of 65,000 lbs. capacity, the name of the builder having not yet been decided, and is building 25 coal and 25 flat cars of 80,000 lbs. capacity at its Montgomery, Ala., shops. The box cars will weigh 3,500 lbs., and measure 36 ft. long, 8 ft. 11 in. wide and 12 ft. 10 in. high, from top of rail to roof. The coal cars will weigh 36,500 lbs., and measure 36 ft. long, 9 ft. 11 in. wide, and 8 ft. 6 in. high. The flat cars will weigh 32,000 lbs., and measure 36 ft. long, 8 ft. 9 in. wide and 4 ft. 5 in. high. All cars to be built of wood, with wooden underframes. The special equipment for all includes: Iron axles, American cast-steel bolsters, Sterlingworth brake-beams, Lappin steel back brake-shoes, Westinghouse air-brakes, Ajax brasses, Tower couplers, Wagner flush doors on box cars, Miner tandem draft rigging on box and flat cars, Thornburgh tandem draft rigging on coal cars, Harrison dust guards, McCord M. C. B. malleable journal boxes and Scott springs.

BRIDGE BUILDING.

ASHLAND, KY.—A bill has been introduced before Congress to permit the Kenova & Big Sandy R. R. to bridge the Tug Fork of Big Sandy River, on the boundary line between West Virginia and Kentucky.

AKRON, OHIO.—Plans have been made for the proposed Mill street viaduct and will soon be submitted to the interested railroads. The estimated cost is \$125,000.

The City Engineer is making plans for the proposed viaduct on Exchange street. It is not decided if both of these viaducts will be built or only one.

BOSTON, MASS.—The Park Commissioners of Cambridge, in their annual report just submitted, urge the erection of a new bridge on Boylston street, and state that arrangements are well under way to decide on the kind of bridge to be built.

HARRISBURG, PA.—The State Board of Property has decided to advertise for bids for the construction of a new steel bridge over the Susquehanna River at Lewisburg, under authority vested in the Board by the Legislature of 1901. The bridge will be about 1,200 ft. long, and Oscar Thompson has been selected as engineer to draw plans and specifications. Union and Northumberland Counties will pay two-thirds the cost of the bridge and the State the other one-third.

The Board of Public Grounds and Buildings will shortly let contracts for several new bridges.

There is agitation for the erection of a new bridge over the Susquehanna River between Maclay street and West Fairview.

JACKSONVILLE, FLA.—Bids are wanted until Feb. 1, with plans, specifications, etc., for building the Bridge street viaduct. It will be about 840 ft. long and 60 ft. wide, preferably of concrete-steel construction, divided into several spans. E. B. Pleasant, Chief Engineer of the Atlantic Coast Line, is a member of the committee to receive bids.

KANSAS CITY, MO.—The Common Council has passed an ordinance requiring viaducts for foot and vehicle traffic over the railroad tracks on Summit street, Holmes street, Broadway and Lydia avenue.

According to reports from this place, it is quite probable that the contract for the Summit street bridge will be let soon. The railroads interested have reached an agreement.

McKEES ROCKS, PA.—The Council has considered favorably the report for a new bridge over the Chartiers Creek at the foot of Singer avenue.

MARSEILLES, ILL.—Bids will soon be wanted for the bascule bridge over the Illinois & Michigan Canal. G. C. Stebbins, Mayor.

MILWAUKEE, WIS.—Local reports state that bids will probably be wanted soon for work in connection with the depression of the Chicago & North Western tracks in the Eighteenth Ward. Contracts for preliminary work are being let.

NEW YORK, N. Y.—Bids are wanted Jan. 30 by the Aqueduct Commissioners for 14 steel highway bridges in Westchester County. Wm. H. Ten Eyck, President.

NORTHFIELD, MASS.—The County Commissioners, according to local reports, have selected a site for the proposed bridge over the Connecticut River between North-

field and Greenfield. As stated in these columns some time ago, the bridge between these two cities will be built on the cantilever principle and be about 512 ft. long.

OREGON CITY, ORE.—The Oregon City & Suburban Ry., according to report, will build a \$40,000 bridge over the Willamette River.

PEORIA, ILL.—Bids are wanted Jan. 27 at the office of the City Clerk, R. M. Orr, for a concrete and steel bridge over Farm Creek.

ST. CONSTANT, QUE.—The Canadian Pacific bridge at St. Constant, about 13 miles south of Montreal, was burned a few days ago. It was 145 ft. long and was one of the wooden structures which the company proposes replacing by steel.

SANTA BARBARA, CAL.—Estimates are to be made by the City Engineer at once for some stone bridges, the cost of which will probably reach \$40,000.

WHEELING, W. VA.—Several large bridges will be needed on the extension of the Little Kanawha R. R., which has been mentioned in these columns several times. The two most important bridges will be across the Ohio and the Little Kanawha Rivers.

YOUNGSTOWN, OHIO.—The County Commissioners have ordered bids asked for building the bridge from the end of Mahoning avenue over Mill Creek to Power's Hill.

Other Structures.

AKRON, OHIO.—It is stated that the Erie has in view building a number of new stations in the near future. The places included are Sharpsville, Warren and Youngstown.

ANNAPOLIS, MD.—Philip Cooper, of Annapolis, has made plans for the new car shops for the Baltimore & Annapolis Short Line. The new shops will be built opposite the passenger station and will be made as near fire-proof as possible. The railroad company will shortly build a new freight station near College Creek.

BALTIMORE, MD.—Grain elevator No. 3 in lower Canton was destroyed by fire recently, causing a loss of nearly \$500,000. Geo. C. Wilkins, General Agent of the Pennsylvania at Baltimore, is President of the Elevator Company.

BUFFALO, N. Y.—A building permit has been issued to the International Steam Pump Co. for a large brick and steel machine shop to be built on Robert avenue near Clinton street, at a cost of \$100,000. The building will have a frontage of 535 ft., and will be 110 ft. deep and 40 ft. high.

CHATTANOOGA, TENN.—An officer of the Central of Georgia writes that there is no foundation at present for the report that the Central of Georgia has decided to move its shops from Chattanooga to Cedartown, Ga.

COUNCIL BLUFFS, IOWA.—Reports state that the Chicago Great Western has let a contract to E. A. Wickham, of Council Bluffs, to build a 10-stall roundhouse, repair shops, sand house, oil house and several smaller buildings, at a total cost of \$35,000. It is said the contracts for the new passenger station and freight depot for the Chicago Great Western will probably be let within a short time.

DALLAS, TEXAS.—President B. F. Yoakum, of the St. Louis & San Francisco, while on a recent trip to Texas announced that his road would build its own passenger and freight terminals at Dallas. It had been reported that this road would join in the movement for a union passenger station, and that it would use the freight terminals of the Cotton Belt at Dallas.

HAMILTON, ONT.—Messrs. Kerr & Coombes, iron founders, have bought the business of Copp Bros., and local reports state that improvements are to be made.

LAREDO, TEXAS.—The Rio Grande & Eagle Pass is building new shops, a roundhouse and enlarging its yards at Laredo.

LONG ISLAND CITY, N. Y.—Among the improvements contemplated by the Long Island R. R. is a new passenger station at Rockaway Beach. Changes are also to be made in the yard at that place.

MAHONINGTOWN, PA.—Reports from New Castle state that the Elliott-Blair Cold Rolled Steel Co. contemplates removing its plant to Mahoningtown and rebuilding it on a larger scale. Thomas C. Elliott is Superintendent.

MAUMEE, OHIO.—The Goulds are reported to have selected Maumee as the site for the new car shops for the Wabash, Ann Arbor and Wheeling roads.

MOBILE, ALA.—Bids are wanted Jan. 17 by F. T. Lack at Mobile for the joint freight depot for the Mobile & Ohio and Southern Ry. at Meridian, Miss.

MUSCATINE, IOWA.—The Chicago, Rock Island & Pacific, according to report, contemplates building a number of new stations on its lines in Iowa.

NEW YORK, N. Y.—The Manhattan Transit Co., which is to build a tunnel railroad under the East River between Manhattan and Brooklyn Boroughs, has secured the necessary land for its terminal station in Brooklyn. It has bought the block at Fulton and Furman streets. Chas. St. Clair Drummond is President.

PHILADELPHIA, PA.—Building permits have been issued to Roydhouse, Arey & Co. for the improvements to the Baldwin Locomotive Works. The work will include a power house at Sixteenth and Hamilton streets, and a new roundhouse at Twenty-sixth and Aspen streets. All the improvements were recently described and illustrated in the *Railroad Gazette*.

SAN ANTONIO, TEXAS.—C. H. Markham, Vice-President of the Southern Pacific's lines in Texas, says that the shops of that road are not to be removed from San Antonio as was reported. Arrangements are being made, however, to move the switching yards to a point outside of the city.

SHARON, PA.—Geo. W. Darr, President of the Sharon Steel Co., is reported as saying that since the United States Steel Corporation has acquired the Sharon Steel Co., it is probable that the tube plant long contemplated by the Corporation will be built at Sharon instead of McKeesport, as originally intended.

THREE RIVERS, MICH.—Stevens & Blume, architects, of Detroit, Mich., are making plans for the works to be built for the Sheffield Car Co. to be located at Three Rivers. The main building will be a steel and brick structure 250 x 90 ft., two stories high.

WASHINGTON, D. C.—Bids were opened at Washington, D. C., Jan. 3, for the building of the new sewage pumping station at the foot of New Jersey avenue, Southeast, which is a part of the sewage disposal system which has been under construction for several years. The bids were based upon the substructure work and the building proper, separately. The various items of the foundation work were bid upon separately, the prices ranging so widely that considerable computation will be required to learn which bid on the substructure work as a whole is lowest. The building will be about 300 ft.

long and 130 ft. wide, and will be of light colored brick with terra cotta trimmings, and fireproof throughout. Seven bids were received, the lowest bid for the building proper being \$279,000 by Ambrose H. Stannard, of New York, who also bid on the substructure work. The other bidders for the building were: The Brennan Construction Company, of Washington, D. C., \$308,000; The George A. Fuller Company, \$323,934; the Penn Bridge Company, of Beaver Falls, Pa., \$334,737; Herman Probst, of New York, \$358,600, and Richardson & Burgess, of Washington, D. C., \$330,350. All of these bid also on the substructure.

YOUNGSTOWN, OHIO.—An officer of the Republic Iron & Steel Co. is reported as saying that the two 5-ton converters of the Bessemer steel plant will be substituted by two 10-ton converters. The company has contracted for a number of other changes and is considering erecting an additional mill along the Mahoning River, near the plant of the National Tube Co.

It is announced that the Erie Railroad will build a new station in Youngstown.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvi.)

St. Louis Railway Club.

The January meeting of this club was held Friday, the 9th inst. A paper on "The Flexible Car Truck" was presented by Mr. Chas. S. Shallenberger, Mechanical Superintendent, Republic Railway Appliance Co.

American Society of Civil Engineers.

On Wednesday, Jan. 7, at 8:30 p.m., there was a regular business meeting of the Society, and the informal discussion on the topic, "The Sanitary Disposal of Municipal Refuse," which took place at the meeting of Dec. 17, 1902, was continued.

Northwest Railway Club.

At the December meeting the papers presented were "The Training of the Special Apprentices," by Messrs. T. A. Foque and T. Roope; also the "Ideal Driving Box," by R. P. Blake, Montreal, Engineer Northern Pacific Ry. Discussion was held on both these topics.

New England Railroad Club.

Car Lighting will be the subject for discussion at the next regular meeting of the New England Railroad Club, to be held at Pierce Hall, Copley Square, Boston, Tuesday, Jan. 13, at 7:45 p.m. Representatives of several of the well-known manufacturers of lighting equipment are expected to be present to read papers upon the subject.

Richmond Railroad Club.

A regular meeting of the Richmond Railroad Club was held at the rooms of Railroad Y. M. C. Association, Main Street Station, Jan. 8, at 8 o'clock p.m. Paper for discussion was "Modern Systems of Compounding," by Mr. J. T. Burton-Alexander, Foreign Correspondent of the *Railroad Gazette*.

The topical discussion was, Which is preferable for back ends of main rods—a plain brass, or one filled with Rabbitt metal or asbestos? Discussion was opened by Mr. H. A. Gillis.

How far should enginemen be held responsible for reporting engine defects? Discussion was opened by Mr. W. T. Smith, M. M., C. & O. Railway.

Canadian Railway Club.

At the meeting of the Canadian Railway Club held on Nov. 11, the proceedings of which have just been received, the discussion was continued on Mr. Cowan's paper on "Car Cleaning." Mr. D. B. Swinton, Master Blacksmith of the Canadian Pacific Ry., read a paper on "Blacksmithing."

The President of the Club has appointed the following committee to prepare a paper on the subject, "Method and Appliances for Handling Snow on Railroads." Jas. Elliott, Master Mechanic, Canadian Pacific Ry.; Jas. Ogilvie, Supt. Motive Power, Canada Atlantic Ry.; Thos. McHattie, Master Mechanic Grand Trunk Ry.; Sam. King, Master Car Builder, Intercolonial Ry.; C. Raft, Master Mechanic, Canadian Northern Ry., and Jas. Coleman, Master Car Builder, Central Vermont Ry.

The Car Foremen's Association of Chicago.

For the regular meeting of the Car Foremen's Association of Chicago to be held in Room 209, Masonic Temple, Wednesday, Jan. 14, at 8 o'clock p.m., the following programme has been arranged:

1. Defective railroad crossings and the damage they cause to car equipment.

2. Steam heating of passenger trains. Representatives of the steam heating companies will be present to discuss the subject.

3. B delivers A's car home at a junction point with two draft sills applied, without defect card or repair card attached. In view of Rule 63 is this a cardable defect?

It is expected that this meeting will be of particular interest to passenger car men and a special invitation is extended to all passenger yard foremen to attend.

The Railway Signaling Club.

A regular meeting of the Club will be held at the Great Northern Hotel, Chicago, on Tuesday, January 13, at 2 p.m.

President H. C. Hope, of St. Paul, announces the following committees to serve during the ensuing year:

On Signal and Track Circuits.
J. C. Mock, Chairman, M. C. R. R.; W. E. Foster, Pa. Lines West; F. P. Patenall, B. & O. R. R.; L. R. Clausen, C. M. & St. P. Ry.; George Boyce, C. St. P., M. & O. Ry.

On Organization.
E. B. Ashby, Chairman, L. V. R. R.; H. C. Hope, C. St. P. M. & O. Ry.; B. B. Adams, *Railroad Gazette*; C. A. Christofferson, C. G. W. R. R.; G. S. Pfasterer, C. & E. I. Ry.

On What Shall Be Considered as Cost in Making Estimates on Installations, and for Maintenance.
H. M. Sperry, Chairman, Union S. & S. Co.; Azel Ames, B. & O. R. R.; P. G. Ten Eyck, N. Y. C. & H. R.; A. J. Wilson, Hall S. Co.; J. T. Cade, Pneumatic Sig. Co.

Cost of Installing Iron and Copper Wire for Line Circuits.
H. S. Baillet, Chairman, L. V. R. R.; W. A. D. Short, C. N. O. & T. P. Ry.; Chas. Selden, B. & O. R. R.; S. K. Bullard, M. K. & T. Ry.; C. S. Rhoads, C. C. & St. L. Ry.

On Distinct Signals: When Under Various Conditions They Should Be Mechanical, Semi-Automatic or Automatic.
A. G. Shaver, Chairman, U. P. R. R.; W. H. Elliott, C. M. & St. P. Ry.; G. S. Pfasterer, C. & E. I. R. R.; H. H. Goodman, C. C. & St. L. Ry.; J. A. Peabody, C. & N. W. Ry.

On How to Best Automatically Signal a Single Track Road.
H. C. Morrison, Chairman, Erie R. R.; A. H. Rudd, D. L. & W. R. R.; J. E. Gillmor, L. I. R. R.; W. L. Dryden, Staten Island R. T. R. R.; A. H. Rice, D. & H. R. R.

On Standards.
C. A. Christofferson, Chairman, C. G. W. Ry.; Chas. Dun-

ham, I. C. R. R.; J. W. Peck, C. T. T. Ry.; C. C. Rosenberg, L. V. R. R.; P. G. Ten Eyck, N. Y. C. & H. R.

On Topics—

C. C. Rosenberg, Chairman, L. V. R. R.; W. J. Gillingham, Hall S. Co.; A. M. Keppel, Penn. R. R.; B. B. Adams, *Railroad Gazette*; J. C. Mock, M. C. R. R.

On Three-Position; Separate-Horn-and-Distant; and Overlapping Automatic Block Signals.

C. C. Anthony, Chairman, Penn. R. R.; G. B. Gray, Pa. Lines West; W. W. Slater, Southern Pac. Co.; E. D. Wileman, L. S. & M. S. Ry.; A. R. Raymer, P. & L. E. R. R.

American Society of Civil Engineers.

The 50th annual meeting of the American Society of Civil Engineers will be held in New York Jan. 21 and 22. The official programme is as below:

Wednesday, Jan. 21: 10 a.m.—The 50th annual meeting will be called to order in the Auditorium of the Society House, 220 West 57th street. The annual report of the Board of Directors, and reports from any Special Committees which are ready, will be presented. Officers for the ensuing year will be elected, members of the Nominating Committee appointed, and a proposed amendment to the Constitution, concerning the method of elections to membership, considered. Other business may also be transacted. 1 p.m.—Lunch will be served, after which, if necessary, the business meeting will be resumed. As soon as possible after lunch, a meeting of the Board of Directors will be held. 3 p.m.—A party will be organized for a visit, under the guidance of Alfred Craven, M. Am. Soc. C. E., Div. Engr., Rapid Transit Commission, to that part of the tunnel under his charge between 59th and 42nd streets. Last year the members present at the annual meeting walked through part of this section; this year they will be afforded an opportunity of seeing the progress which has been made during the year. Members who desire to see other parts of the tunnel will be given an opportunity to do so. 9 p.m.—Reception at the House of the Society, for members, the ladies of their families, and such other guests as they may invite.

Thursday, Jan. 22.—This day will be devoted to an excursion by steamer, admission to which will be by ticket only. 10 a.m.—The steamer "Valley Girl" will leave the Recreation Pier, foot of 24th street, East River, Manhattan, promptly, and will proceed to Blackwell's Island, where, by invitation of the Commissioner of Bridges, the party will visit the site of the Blackwell's Island Bridge (No. 4), the masonry piers of which are in course of construction. A description of the work has been furnished by H. A. La Chicotte, M. Am. Soc. C. E., Engineer in Charge, and A. McC. Parker, M. Am. Soc. C. E., of Ryan & Parker, the contractors. The party will re-embark, and, weather permitting, will steam through the Harlem River, the Harlem Ship Canal and Spuyten Duyvil Creek, down the Hudson to Hoboken, where, by invitation of the North German Lloyd Steamship Co., W. F. Whittemore, Assoc. M. Am. Soc. C. E., Engineer, and R. P. and J. H. Staats, Members, Am. Soc. C. E., Contractors, the work in progress on the new piers and bulkhead structures of that company will be inspected.

NORTH GERMAN LLOYD IMPROVEMENTS IN HOBOKEN.

These improvements were made necessary by the total destruction of the former piers of this company by fire, on June 30, 1900. The improvement consists of three piers varying from 870 to 900 ft. in length, two of them 80 ft. in width, and the third 90 ft. in width. The distance between piers is 250 ft. The pier sheds are two stories in height, with steel frames, the second floor being suspended from the roof. For derrick purposes, the posts are extended to a height of 62 ft. above the piers. The bulkhead is a masonry wall of granite and concrete, on pile foundations cut off at 24 ft. below low water. The bulkhead building is 130 ft. wide, about 900 ft. long, two stories in height, and is constructed entirely of steel, concrete, brick, and wire-glass. The floors and roof are of concrete on iron beams. The roof is enclosed with a parapet, and is intended for use as a promenade. The exposed posts and girders in the bulkhead building, and the posts and girders under the second floor of the pier sheds, are enclosed with concrete and steel casings, ¼ in. thick, as a protection against fire. Many novel features of construction have been used, and the whole work is planned to produce, as nearly as is possible under the conditions of location, a fire-proof structure.

8:30 p.m.—A smoker will be held at the Society House.

PERSONAL.

—Mr. W. C. Loree, Division Superintendent of the Baltimore & Ohio Railroad, was born in 1860. At the age of 23 he entered the service of the Chicago, St. Louis & Pittsburgh as a rodman, and from then until August, 1899, when he became Division Superintendent of the Pittsburgh, Cincinnati, Chicago & St. Louis, Mr. Loree held various positions with different companies.

—The Second Vice-President of the Louisville & Nashville, Mr. A. W. Morris, was born in London in 1861. On Oct. 1, 1880, he entered the service of the Louisville & Nashville and has been successively bookkeeper, assistant to the transfer agent and secretary to the President. In 1886 he was made Assistant Secretary and Assistant Treasurer, which position he held until Dec. 1, when he assumed his new duties.

—Mr. O. P. Chamberlain, Division Engineer of the Chicago Great Western, was born in Rensselaer County, N. Y., and is a graduate of the University of Pennsylvania class of 1889. He was at one time Assistant Engineer of the Philadelphia, Wilmington & Baltimore, but later left this company to become Assistant Engineer of the Chicago Great Western at St. Paul. On Dec. 15, 1902, he was appointed Division Engineer.

—Mr. Fred S. Darling, Division Engineer of Construction for the Canadian Pacific Railway at Montreal, was born at Burlington, R. I., in 1863. In 1887 he entered the service of the Duluth, Watertown & Pacific, a branch of the Great Northern, and was, until January the following year, a clerk. For a few months he served as a topographer on the Yankton & Sioux Falls. He was then transferred as a rodman on the Eastern Railway of Minnesota, but later resigned to go with the Northern Pacific, with which company he filled the positions of leveler, assistant engineer and division engineer, until December, 1902, when he resigned to go with the Canadian Pacific as above.

—Mr. Charles H. Tweed, who shortly after the death of Mr. Huntington, became Chairman of the Board of Directors of the Southern Pacific Company, tendered his resignation on Dec. 31, last, in view of becoming a partner in the banking firm of Speyer & Company on Jan. 1. Mr. Tweed was born in 1844 and graduated from Harvard in 1865. He studied law under Mr. E. H. Bennett, of Massachusetts, and at the Harvard Law School, was admitted to the Bar in New York in 1868, and became a member of the firm of Evarts, Southmayd & Choate in 1874, in which company he continued until

Jan. 1, 1883, when he became General Counsel for the Central Pacific Railroad, the Chesapeake & Ohio Railway and other Huntington properties.

—The new Superintendent of Motive Power of the Philadelphia, Baltimore & Washington (formerly Philadelphia, Wilmington & Baltimore), Mr. James Milliken, was born Feb. 19, 1865, at Newtown, Pa., and was educated at the Philadelphia public schools and at the University of Pennsylvania. Mr. Milliken began his railroad service in 1885 as a fireman with the Pennsylvania Railroad and the following year was transferred to Altoona as an apprentice. In January, 1890, he was appointed Assistant Road Foreman of engines on the Philadelphia Division, and in 1891 was transferred to the Pittsburgh Division. He then became Assistant Master Mechanic and remained in this capacity until 1895, when he was appointed Assistant Engineer of Motive Power of the Philadelphia, Wilmington & Baltimore. In 1899 he was again transferred to the United Railroads of New Jersey Division in a similar capacity, and in 1900 was made Master Mechanic of the Northern Central. Mr. Milliken assumed his new duties on Jan. 1.

—Mr. James McNaughton, Superintendent of the Brooks Works of the American Locomotive Company, Dunkirk, N. Y., has been appointed General Superintendent of both the Brooks Works and Schenectady Works, succeeding Mr. J. E. Deems, heretofore General Superintendent at Schenectady, resigned. Mr. McNaughton's appointment took effect on the first of the month and he will have his headquarters at Schenectady. Mr. McNaughton was born in August, 1859, at Queensville, Ont. After an apprenticeship of five years in a machine shop, he began his railroad service in 1880 as a machinist on the Chicago & West Michigan Ry. Since then he has held the following positions: From 1880 to 1882, machinist with the Minneapolis & St. Louis; machinist at Brainerd, Minn., for the Northern Pacific from March, 1882, to September of that year; then he became Master Foreman and was appointed General Foreman in 1884, remaining as such until 1888, then being appointed Master Mechanic of the Montana Division of the Northern Pacific. He left that road in 1890 to become Superintendent of Motive Power of the Wisconsin Central lines. Four years later he was appointed Superintendent of Motive Power and of Cars for the same lines, remaining until June 30, 1898, when he was appointed Superintendent of the Brooks Works. It is quite probable that Mr. McNaughton's jurisdiction will include (soon if not at first) the other works of the American Locomotive Company.

—Mr. W. G. Besler, of the Central Railroad of New Jersey, whose title has just been changed to Vice-President and General Manager, is a son of Mr. J. D. Besler, former General Superintendent of the Chicago, Burlington & Quincy.



the General Superintendency. Mr. Besler assumed the General Managership of the Central of New Jersey in March last year.

ELECTIONS AND APPOINTMENTS.

Ann Arbor.—W. L. Greenhalgh has been appointed Auditor, with headquarters at Toledo, Ohio, succeeding W. O. Brigham, assigned to other duties. The headquarters of W. F. Bradley, Superintendent, have been removed from Durand, Mich., to Toledo.

Baltimore & Ohio.—The title of A. M. Kinsman, Engineer of Construction, has been changed to Assistant Engineer of Maintenance of Way, with headquarters at Baltimore, Md. Mr. Kinsman's jurisdiction extends over all B. & O. lines.

The titles of Paul Didier (Assistant Chief Engineer), W. B. Hanlon and F. L. Stuart (Assistant Engineers), have been changed to District Engineers. Mr. Didier will have charge of construction work on the Pittsburgh & Western District, at Allegheny. Mr. Hanlon will have charge of construction work on the Cleveland and the New Castle Divisions west of Akron, at Cleveland, Ohio, and Mr. Stuart will have charge of construction of the Bedford & Western and Branch Lines in Pennsylvania, at Somerset, Pa.

Bradford, Bordell & Kinzua.—A. B. Campbell has been appointed General Manager, with headquarters at Bradford, Pa., succeeding J. C. McKenna, resigned.

Burlington & Missouri River in Nebraska.—H. J. Helps has been appointed Master Mechanic, succeeding D. Hawksworth, resigned.

California State R. R. Commission.—The President of the Commission is A. C. Irwin, of Yuba County, and the Secretary is J. C. Brusie, of Marin County.

Canadian Pacific.—B. W. Greer, heretofore Assistant General Freight Agent, has been appointed General Freight Agent (Pacific Division), succeeding F. W. Peters. C. N. Monsarrat has been appointed Engineer of Bridges, with headquarters at Montreal, Que., succeeding H. E. Vautelle, resigned. C. H. Temple has been appointed Master Mechanic of the Pacific Division, with headquarters at Revelstoke, B. C., succeeding G. Hall, transferred.

Central New England.—C. W. Chapin has been elected President, succeeding J. W. Brock, resigned.

Chesapeake & Ohio.—E. P. Goodwin, heretofore Trainmaster, has been appointed Assistant Division Superintendent, with headquarters at Hinton, W. Va.

Cincinnati, Georgetown & Portsmouth.—E. M. Stevens has been appointed General Superintendent. The position of General Manager has been abolished.

Cincinnati, Hamilton & Dayton.—H. Miller has been appointed Superintendent of Bridges and Buildings of the Northern Division, with headquarters at Lima, Ohio, succeeding C. M. Overly.

Cincinnati, New Orleans & Texas Pacific.—See Queen & Crescent.

Columbia Railway & Navigation.—See Western Maryland.

Delaware, Lackawanna & Western.—W. F. McFarlin, Chief Engineer, with headquarters at Hoboken, N. J., has resigned, effective Feb. 1.

Eric.—E. B. Thomas, Chairman of the Board; G. M. Cumming, First Vice-President, and J. A. Middleton, Second Vice-President and Secretary, have all resigned, and the resignations are already effective. It is supposed that Daniel Willard, now Third Vice-President, will be made First Vice-President, but that promotion has not yet been officially announced.

R. M. Parker, heretofore Assistant General Freight Agent, has been appointed General Freight Agent, succeeding the late Mr. Leeming.

Grand Trunk.—W. H. Biggar has been appointed Assistant General Counsel, with headquarters at Montreal.

Great Northern.—M. D. Grover has been appointed General Counsel. This is a new office recently created. R. A. Wilkinson succeeds Mr. Grover as General Solicitor.

Gulf, Colorado & Santa Fe.—F. Merritt has been appointed Resident Engineer of the Northern Division, with headquarters at Cleburne, Texas. J. C. Christy becomes Resident Engineer of the Southern Division at Temple, and M. F. Temple becomes Resident Engineer of the Beaumont Division at Beaumont.

Illinois Central.—F. B. Bowes has been appointed Assistant Traffic Manager, with headquarters at Chicago, and C. C. Cameron succeeds Mr. Bowes as General Freight Agent at Louisville, Ky. Mr. Cameron in turn is succeeded by D. W. Longstreet as Assistant General Freight Agent at Louisville, Ky. (See Tennessee Central.)

Kansas City, St. Joseph & Council Bluffs.—A. V. Brown has been appointed Assistant Superintendent, with headquarters at St. Joseph, Mo., succeeding R. K. Smith.

Louisiana & Arkansas.—F. D. Havens has been appointed Purchasing Agent, with headquarters at Texarkana, Ark., succeeding J. A. Buchanan, resigned.

Louisville & Nashville.—W. A. Colston has been appointed Assistant Auditor of Receipts, with headquarters at Louisville, Ky., succeeding P. O. Stewart, resigned.

Maine Central.—M. F. Dunn, heretofore Acting Division Superintendent at Bangor, Me., has been appointed Division Superintendent.

Maricopa & Phoenix.—M. O. Bicknell, General Freight and Passenger Agent, has been appointed Superintendent, succeeding B. F. Porter, resigned.

Mexican International.—W. S. Martin, heretofore Superintendent of the St. Louis-Louisville Lines (Southern), has been appointed General Manager of the M. I., with headquarters at Ciudad Porfirio Diaz, Coahuila.

Michigan Central.—W. C. Rowley has been appointed General Freight Agent. W. C. Lewis succeeds Mr. Rowley as Assistant General Freight Agent at Bay City, Mich.

National of Mexico.—A. Clark has been appointed Division Superintendent, with headquarters at Laredo, Mex., succeeding J. S. Capers, Acting Superintendent, resigned.

New York Central & Hudson River.—The jurisdiction of William F. Jordan, Principal Assistant Engineer in charge of construction, has been extended over the part of the Western District that includes the Western Division, the Fall Brook Line, and the Rome, Watertown & Ogdensburg Sub-Districts, with headquarters at New York City. John Krey has been appointed Division Engineer of the Marine Division, in charge of the maintenance and construction of bridges, buildings, docks and wharves, reporting to the Principal Assistant Engineer on contract matters and to the Engineer of Structures on all maintenance matters, with headquarters at Weehawken, N. J. This division will include New York City south of Spuyten Duyvil and Mott Haven, the Port Morris Terminal, the Weehawken Terminal east of the tunnel, and the New Jersey Junction Railroad. The Division Engineers of the Eastern and River Divisions will continue to exercise jurisdiction over track work within the above named territory. F. W. Everett, Assistant Division Superintendent at Syracuse, has been appointed Division Superintendent, with headquarters at Buffalo, N. Y., succeeding J. P. Bradford.

New York, Ontario & Western.—F. W. Smith has been appointed Assistant General Freight and Passenger Agent.

Norfolk & Western.—Owing to ill health James C. Cassell, General Superintendent, has been granted a long leave of absence on full pay. Mr. Cassell intends taking a long sea voyage and upon his return is to be appointed Assistant General Manager.

N. D. Maher, heretofore General Superintendent of the Seaboard Air Line, has been appointed General Superintendent of the N. & W., with headquarters at Roanoke, Va., succeeding Mr. Cassell.

The position of Engineer of Maintenance of Way has been abolished and C. S. Churchill has been appointed Chief Engineer.

Northern Central.—Jas. T. Wallis, heretofore Assistant Engineer of Motive Power of the Pennsylvania, has been appointed Master Mechanic of the N. C., with headquarters at Baltimore, Md., succeeding Jas. Milliken, promoted.

Pennsylvania.—See Northern Central.

Pennsylvania Company.—A. P. Griest has been appointed Auditor of Coal Freight Receipts at Pittsburgh, Pa., and John B. Brittain, Assistant to the Comptroller. Robert Trimble has been appointed Chief Engineer of Maintenance of Way of the Northwest System, with headquarters at Pittsburgh, Pa., and W. C. Cushing becomes Chief Engineer of Maintenance of Way of the Southwest System at Pittsburgh. E. G. Ericson has been appointed Principal Assistant Engineer of the Northwest System at Pittsburgh, and B. V. Sommerville becomes Principal Assistant Engineer of the Southwest System at Pittsburgh.

E. T. Whiter, heretofore Trainmaster, has been appointed Division Superintendent (Northwest System), with headquarters at Allegheny, Pa., succeeding Mr. Cushing.

Pere Marquette.—S. T. Crapo has been appointed General Superintendent, with offices at Detroit, Mich. The office of Assistant to the General Manager has been abolished.

Philadelphia & Reading.—O. W. Stager, heretofore Transportation Master, has been appointed Superintendent of Transportation, with headquarters at Philadelphia, Pa.

Queen & Crescent.—W. H. Starr has been appointed

Superintendent of the Chattanooga Division, succeeding G. W. Berry, assigned to other duties.

St. Louis Southwestern.—J. F. Lehane, General Freight Agent of the St. Louis Southwestern of Texas, will assume the duties formerly discharged by W. H. Weeks, General Passenger Agent. Mr. Weeks has resigned, effective Jan. 7.

Seaboard Air Line.—F. K. Huger has been appointed General Superintendent, with headquarters at Portsmouth, Va., succeeding N. D. Maher, resigned. Mr. A. W. Towsley has been appointed Superintendent of the Second Division, with headquarters at Raleigh, N. C., succeeding Mr. Huger. Effective Jan. 5. (See Norfolk & Western.)

Southern.—S. R. Kennedy has been appointed Acting Superintendent of the St. Louis-Louisville Lines, with headquarters at Princeton, Ind., succeeding W. S. Martin, resigned. (See Mexican International.)

Tennessee Central.—O. M. Sewell, heretofore Trainmaster of the Illinois Central, has been appointed Superintendent of the T. C., with headquarters at Nashville, Tenn. W. M. Baxter has been appointed Mechanical Superintendent.

Wabash.—The headquarters of J. B. Barnes, Superintendent of Motive Power and Machinery, have been removed from Springfield, Ill., to Ft. Wayne, Ind.

Western Maryland.—J. Q. Barlow, heretofore Chief Engineer and Manager of the Columbia Ry. and Navigation at Dalles, Ore., has been appointed Chief Engineer of the W. M., with headquarters at Baltimore, Md., effective Jan. 1. V. G. Bogue has been appointed Consulting and Supervising Engineer. Mr. Bogue does not relinquish his business as Consulting Civil Engineer at 66 Broadway, New York City.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

AROOSTOOK VALLEY (ELECTRIC).—A petition has been filed by this company with the Railroad Commission asking for the approval of a line running through Presque Isle, Mapleton and Washburn, a distance of 12 miles.

AUGUSTA-AIKEN (ELECTRIC).—This company has been incorporated in New Jersey to build between the above named places in South Carolina, a distance of 12 miles. K. K. McLaren and Louis B. Daly are among the incorporators.

BRITISH COLUMBIA ROADS.—Application will be made at the next session of Parliament for the incorporation of a company to build from Fernie, in East Kootenay, B. C., to the mouth of Morrissey Creek, along the Elk River; thence along Flatbush River to a point on the International boundary. Messrs. Cornwall & Rogers, of Victoria, B. C., are interested.

CANADIAN PACIFIC.—It is reported that this company intends to change its line west of Moosejaw, N. W. T., by straightening out all curves and lessening grades. An extension from Church Bridge to Pleasant Hills is projected.

CANE BELT.—The extension of this road from Bay City to Matagorda, Texas, a distance of 21½ miles, has been completed. C. H. Sharman, Eagle Lake, Texas, is Chief Engineer.

CARDIFF.—Application will be made at the next session of Parliament to incorporate a company to build from a point in township 6, west of the Fifth Meridian, in the North West Territories, to a point on the Crow's Nest branch of the Canadian Pacific, near the village of Frank, Alberta. Latchford, Macdougall & Daly, of Ottawa, are said to be interested.

CINCINNATI, RICHMOND & MUNCIE.—The extension of this road from Cottage Grove, Ind., to Cincinnati, Ohio, 44 miles, has been completed to Peoria, a distance of 12 miles. It is stated that a line is projected from Cincinnati to Louisville, Ky., 110 miles. Wm. J. Allen, of Richmond, Ind., is General Manager.

DALLAS & NEW MEXICO.—At a recent meeting of the stockholders of the Dallas & New Mexico the sale of the franchise rights of that company to the Velasco, Brazos & Northern Railway Company was ratified and a new board of directors chosen. C. C. Waller, of Houston, was elected President. The principal office of this road will be at Dallas, Texas.

DETROIT, TOLEDO & MONROE.—An officer writes that this company, which was recently incorporated in Michigan, will be extended from Monroe to Detroit at once. Matthew Slush, of Detroit, is President; C. A. Black is Vice-President; J. M. Mulkey and C. J. Riley are directors. In our Construction column of Dec. 26 we spoke of this road as the Detroit, Monroe & Toledo Short Line, which is incorrect. The above name is official.

DONALDSONVILLE & NAPOLEONVILLE.—This company has been organized in the State of Louisiana to build between the above named points, a distance of 15 miles along the west bank of the Bayou La Fourche. Wm. M. McGalliard is President; M. D. Bringier, Vice-President, and H. E. Hanson, of Donaldsonville, Secretary.

FELSENTHAL SOUTHERN.—This company has filed articles of incorporation in Arkansas. The proposed road is from Lake Landing through Union Parish, La., a distance of 25 miles. The directors are A. Felsenthal, R. A. Felsenthal, H. M. Marshall, J. N. Parker and others.

GRAND VALLEY (ELECTRIC).—This line has been completed from Brantford to Paris, Ont., seven miles. A section from Paris to Galt, 30 miles, is under contract. J. H. Armstrong, Brantford, Ont., may be addressed.

GREAT FALLS & CANADA.—The work of standard gaging this road, which runs from Great Falls to Lethbridge, 200 miles, has been completed. (Oct. 31, p. 845.)

GULF, COLORADO & SANTA FE.—The report in our last issue that surveys were in progress for the proposed extension from Lometa to Ft. McKavett, Texas, is incorrect. No surveys have been made. (Official.)

HARTFORD & NORWICH (ELECTRIC).—This company has applied to the State Assembly for a charter to build from Norwich to Manchester, Conn., 35 miles. The proposed route will pass through the towns of Norwich, Franklin, Bozrah, Lebanon, Columbia, Andover, Bolton and Manchester.

ILLINOIS CENTRAL.—It is reported that arrangements have been completed for the double tracking of the main line of this road from Memphis to Fulton, Ky., a distance of 122 miles. When this is finished, the Illinois Central will have a double track all the way from New Orleans to Chicago.

JAMES BAY.—Surveys have been completed for an extension from Parry Sound, Ont., to French River, a distance of about 60 miles. Four miles of track from the Quebec siding on the Canada Atlantic to Parry Sound are now in operation. (Oct. 24, 1902, p. 825.)

KANSAS CITY, MEXICO & ORIENT.—It is reported that the Kaw Valley Construction Co. has obtained the contract for building the greater part of this road. It has sublet the 34 miles south of Fairview, Okla. T., to W. C. Edwards, Wichita, Kan., and the 56 miles south of that to the Texas Construction Co., of Sweetwater, Texas.

LARAMIE, HAHN'S PEAK & PACIFIC.—It is reported that this road, which is now building southwest from Laramie, will be extended to Grand Encampment. Grade will be completed to Centennial, 24 miles from Laramie, and the extension from there to Grand Encampment will be begun early in the spring. At present the only route to Grand Encampment is by stages.

LEHIGH VALLEY & NEW ENGLAND.—The Northampton extension has been completed from Nazareth to Stockertown, Pa. Work is in progress on line from Stockertown to Bangor, Pa., 15 miles. W. J. Young, Pen Argyl, Pa., is Chief Engineer.

LIBERTY-WHITE.—J. J. White, of McComb, Miss., has incorporated this road to run from McComb to Liberty, Miss., a distance of 25 miles.

LITTLE FALLS & DOLGEVILLE.—This road has been incorporated as the successor of the Little Falls & Dolgeville under foreclosure sale. Dumont Clarke, of New York city, has been elected President. E. R. Wauckel is Treasurer. G. D. Smith, J. J. Gilbert, of Little Falls, and F. H. Collins, of Tarrytown, N. Y., are directors.

MANSFIELD & EASTERN TRACTION.—This company, which was incorporated in New Jersey on Jan. 6, proposes to build from Mansfield through the towns of Ashland, Millin, Jeromeville, Reedsburg and Wooster, all in the State of Ohio. The incorporators are James J. McGuire, J. W. Galbraith and W. J. Pentz.

MERIDA & PROGRESO.—The gage of this road in the State of Yucatan, Mexico, is being widened from narrow to standard width. The work will be completed about Jan. 10. A large amount of new standard gage rolling stock has been provided for the road.

MEXICAN ROADS.—It is announced that the Guggenheim Exploration Co., which is the Mexican branch of the American Smelting & Refining Co., has approved plans for the immediate building of more than 200 miles of railroad in Mexico. This company owns a number of mines which are remote from railroad facilities and cannot be profitably worked until a railroad connection is made with them.

LA CAMPAÑA INDUSTRIAL DE TRANSPORTES has completed and placed in operation a railroad between San Juan Bautista and Atasta de Serra, Mexico.

A party of surveyors in charge of Engineer A. V. Nesbitt have just completed locating the route of the proposed railroad from the San Carlos mines, in the State of Tamaulipas, Mexico, to Linares, about 40 miles, where connection will be made with the Gulf Division of the Mexican Central. It is reported that work on this road will begin soon.

The Mexican Government has granted a concession to Jose M. Mantilla, Arcadia Zentella, Juan S. Trujillo and J. C. Santa Ana, all citizens of San Juan Bautista, Mexico, to build and operate a railroad between the latter place and Nacajuca, with a branch to connect with the proposed Rio Seco Railroad. The total length of the road is to be about 50 miles.

The Mexican Government has declared forfeited the concession which it granted the Mexican Midland Railroad Company about three years ago to build and operate a line between the city of Durango and Gutierrez. The forfeiture was made because the road was not built within the required time.

Concession has been granted by the Mexican Government to Algernon Jay, of Mexico City, to build and operate a road between the State of Oaxaca and Vera Cruz, starting from Tuxtepec and making connection with the Vera Cruz & Pacific at the coast.

MISSOURI, KANSAS & TEXAS.—Contract for 50 miles of the extension from Coalgate, Ind. T., to Oklahoma City, has been let. This contract covers the distance between Coalgate and Ada, Ind. T.

MOBILE & OHIO.—The contract for grading this road from Okoloma to Big Creek, a distance of 40 miles, has been let to W. J. Oliver & Co., Pittsburgh. The road will be built along the original survey of the Nashville & Mississippi, franchise of which has been purchased by the Mobile & Ohio.

MONTEREY & MINERAL BELT.—The gage of this road between Monterey, Mexico, and San Pablo and San Pedro is to be changed from narrow to standard width. This change is made necessary by the change of the gage of the Mexican National with which it connects.

NATCHEZ & GULF.—An officer writes that the location of a line between Natchez and Gulfport, Miss., is nearly completed. Two parties are in the field working toward each other from the two points named, and work will begin immediately. W. W. Hungerford, Gulfport, is Chief Engineer. (Dec. 12, p. 954.)

NEW ORLEANS & SAN FRANCISCO.—This company was chartered in New Orleans on Jan. 1, with a capital stock of \$5,000,000. It is proposed to build from New Orleans by way of Arkansas to Chicago.

NORTH MISSISSIPPI & BAY SPRINGS.—The Governor of Mississippi has authorized the incorporation of this company to build from Burnsville southward through Fishomingo and Stawamba Counties. E. B. Causey and F. J. Ozanne, of Memphis, Tenn., are among the incorporators.

NORWICH, MYSTIC & WESTERLY (ELECTRIC).—It is reported that this company will build from Norwich, Conn., to Westerly, R. I., 20 miles, along the Norwich & Westerly Turnpike. Costello Lippitt, Norwich, Conn., is said to be backing the scheme.

OREGON R. R. & NAVIGATION.—An officer denies the report that a cut-off is being built from Echo to Coyote, Ore.

OTTAWA, MARSEILLES & MORRIS.—This company has been incorporated in Illinois to build from Ottawa, La Salle County, through Marseilles to Morris, Ill. The directors are M. T. Moloney, J. F. Moloney, M. A. Flynn and James J. Grant, of Ottawa, Ill.

PEARL & LEAF RIVER.—Application has been made to the Railroad Commission for permission to change the terminal of this road from Monticello, in Lawrence County, to Natchez in Adams County. The road now runs from Hattiesburg to Blountville, and is being built beyond Blountville in the direction of Monticello. (Dec. 5, 1902, p. 934.)

PENNSYLVANIA.—The contract for the connecting link between the Pennsylvania and the New York Central & Hudson River at Burnside and Cherry Tree, Pa., a distance of eight miles, has been let to John C. McAtee. (Nov. 28, 1902, p. 918.)

POINT RICHMOND-SAN PABLO POINT.—Contract for building this new belt line has been let to A. L. Stone,

of Oakland, Cal. The proposed route is from Point Richmond, along the shore to San Pablo Point, 20 miles, making connections with the Southern Pacific, Atchison, Topeka & Santa Fe and Standard Oil Companies' tracks. W. S. Tevis is President. (Nov. 21, 1902, p. 902.)

QUEBEC ROADS.—Application will be made at the next session of Parliament to incorporate a company to build from the Bay of the Seven Islands through the Counties of Saguenay and Chicoutimi to Quebec.

RUMFORD FALLS & RANGELEY LAKES.—This road has been extended from Bemis to Oguossoc, Me., 13 miles, and work is in progress between Oguossoc and Kennebago, eight miles. It is proposed to build from this latter point to the International boundary line. R. B. Stratton, of Rumford Falls, Me., is Chief Engineer. (Dec. 20, 1901, p. 884.)

ST. LOUIS & EAST SHORE.—This company has filed articles of incorporation in Illinois to build from East St. Louis through St. Clair, Monroe and Randolph Counties to Fort Gage. The incorporators are J. A. Rearden, F. R. Gore, of St. Louis; L. Robinson, F. J. Kroft, of East St. Louis, and others.

ST. LOUIS, EL RENO & WESTERN.—Charter has been granted this company to build from the eastern part of Oklahoma Territory, in Lincoln County, to a point in Green County, passing through Chandler, Guthrie, El Reno, Anadarko, Hobart and Mangum, a total distance of about 200 miles.

SALMON RIVER.—Application will be made at the next session of Parliament for an act to incorporate the Salmon River Ry. The proposed route is from Ortonville siding, on the line of the Canadian Pacific, to a point near Salmon River Mill, Victoria County, B. C.

SEATTLE & CANADA.—Articles of incorporation were filed by this company in the State of Washington, on Dec. 26. It is proposed to build from Tacoma, Wash., through King, Seattle, Skagit and Whatcom Counties to Sumas, 180 miles. J. H. McGraw, of Seattle, Wash., is said to be interested.

SLAUGHTERS CREEK & COAL RIVER.—This company has been incorporated to build from Winifrede Junction, on the Great Kanawha River, to the mouth of White Oak Creek on Coal River, in Boone County, a distance of 10 miles. W. E. Roe and Geo. Hunter, of Parkersburg, W. Va., are among the incorporators. The principal office of this company will be at Williamstown, W. Va.

SOUTHERN MISSOURI.—The statement in our estimate of mileage for 1902, crediting 22 miles of road between Little Rock Landing and Ozark Summit to the Southern Missouri & Arkansas (St. Louis & San Francisco), is incorrect. It should have been credited to the Southern Missouri.

SOUTHERN PACIFIC.—The extension out of Van Vleck, Texas, through the Caney Valley, 17 miles, has been completed. Ground was broken for this road on May 23, 1902. G. W. Boscke, Galveston, Texas, is Chief Engineer. (July 18, 1902, p. 580.)

SPOKANE & KOOTENAY.—This company has filed articles of incorporation in the State of Washington. It is proposed to build a line from Spokane to connect with the Canadian Pacific. The incorporators are D. C. Corbin and Senator Geo. Turner, of Spokane; ex-Governor J. H. McGraw, of Seattle, and Chas. S. Bihler, of Tacoma, Wash.

SUFFOLK & CAROLINA.—See Railroad News.

TEXAS & PACIFIC.—Press reports state that this road will extend the branch between Weatherford, Texas, and Mineral Wells, to Trinidad, Colo., where connection will be made with the Denver & Rio Grande. The road from Weatherford to Trinidad will be about 450 miles long. No official announcement with regard to this proposed extension has yet been made.

WARASH & ROCHESTER (ELECTRIC).—Surveys are reported finished on this line, which is 35 miles long. The work will probably begin early in the spring. P. A. Tuttle, Geneva, Ohio, is President; T. W. Latham, Cleveland, Ohio, is Secretary.

WESTMINSTER, VANCOUVER & FRASER VALLEY.—Application has been made for a charter for this new road. The proposed route is from Vancouver to New Westminster, on the Fraser River, thence in an easterly direction through Surrey, Langley and Sumas to Chilliwack, a distance of about 60 miles.

GENERAL RAILROAD NEWS.

BELLAIRE, ZANESVILLE & CINCINNATI (ELECTRIC).—A. E. Appleyard, of Boston, has purchased this road. The line is to be made standard gage; electricity will be the motive power for transporting passengers, while steam will be used for carrying freight. The new company will be known as the Ohio River & Western. It covers a distance of 111 miles, running from Zanesville to Bellaire, Ohio.

BRADFORD, BORDELL & KINZUA.—Press reports state that this road will be abandoned. It originally was 131 miles long, but 82 miles between Kane and Foxburg were recently cut out by the termination of a lease from the Baltimore & Ohio. This was due to failure to meet financial obligations. This road was very wealthy in the early eighties when the oil regions through which it was built were the scenes of great activity. (Nov. 28, p. 918.)

BROCKVILLE, WESTPORT & SAULT STE. MARIE.—Press reports state that a syndicate has been formed to buy this road at the foreclosure sale on Jan. 20. The syndicate now owns nearly all the \$1,125,000 bonds of the company, and has asked for subscriptions to \$500,000 of these bonds. Five shares of common and five shares of preferred stock go as a bonus with each bond. John Gerken and Henry Gennerich, President of the United National Bank, are named as members of the syndicate. The Brockville, Newport & Sault Ste. Marie runs between Brockville and Westport, Ont., 45 miles, and connects with the Canadian Pacific, Grand Trunk, and New York Central & Hudson River by means of a ferry at Brockville. (Dec. 5, 1902, p. 934.)

CHICAGO & ALTON.—A joint mortgage of \$475,000 has been filed by this company and the Mobile & Ohio with the Equitable Trust Co. of New York, to secure payment of 500 cars purchased by the two railroads.

CHICAGO & SOUTHEASTERN (MIDLAND).—Judge J. B. Anderson, of the Federal Court, Indianapolis, has ordered the foreclosure sale of this property. The Cleveland, Cincinnati, Chicago & St. Louis owns most of the securities of this road.

GEORGIA NORTHERN.—This road, which extends from Pidcock to Albany, Ga., a distance of 70 miles, has been bought by the Atlantic Coast Line. The stock was originally held by the Pidcock Bros. No change will be made in the officers of the road, with the possible exception of the President.

GREAT NORTHERN OF CANADA.—By acquiring the franchise of the Chateaugay & Northern for right of way between Joliette and Montreal, as well as the franchise of the Montreal Terminal Company, which owns the right of way over the Island of Montreal, the Great Northern of Canada has completed its plans for a Montreal terminus and a Transcontinental line. It has thus not only gained access to the wharves of Montreal, but on completion of the Chateaugay & Northern it will have a line to every important town north of the St. Lawrence in the Province of Quebec, as well as the shortest line between Quebec and Montreal. The cost of building the new line into Montreal, including terminals and one bridge, will be about \$1,000,000.

KANSAS CITY, MEXICO & ORIENT.—A contract with the Hamburg-American Packet Co. has been made by this company. Port Stillwell, the terminus of the road on the Mexican Coast, is the point where connection will be made with the steamship line, and this will afford the Kansas City, Mexico & Orient a direct route to Hongkong by way of Honolulu.

LEHIGH VALLEY.—The gross earnings of this company for the five months ending Nov. 30 were \$8,751,889, showing a decrease of \$3,292,918 over the same five months last year. After deducting \$7,718,815 expenses and taxes as against \$7,931,708 last year, the balance this year shows a decrease of \$3,080,025, due mainly to the coal situation.

LOUISVILLE & NASHVILLE.—It is announced that this company has recently leased three blocks in Cincinnati known as the Wiggins property, and will erect freight terminal sheds upon it. The Cincinnati Southern has been negotiating for this property for several weeks.

MICHIGAN CENTRAL.—Suit has been brought by this road against the State of Michigan for \$6,000,000 damages resulting from the recalling of its special charter by an act of the State Legislature. The State of Michigan gave its consent to be sued when it revoked the charter. Under the special charter, the Michigan Central charged 3 cents a mile for passenger fare, and paid a specific tax on gross earnings. Under the present law it can charge only 2 cents a mile, and is subject to an ad valorem tax on its property, thereby nearly doubling its annual taxes. (Jan. 10, 1902, p. 32.)

MOBILE & OHIO.—See Chicago & Alton, Railroad News.

NATCHEZ & SOUTHERN.—This company, which was recently incorporated in Mississippi, has purchased the property of the New Orleans & Northwestern. The officers of the new road are E. G. Merriam, St. Louis, President; E. B. Brown, Natchez, Vice-President, and D. H. Smith, Treasurer. (Jan. 2, 1902, p. 18.)

NEW YORK, NEW HAVEN & HARTFORD.—A joint purchase has been made by this company and the Pennsylvania, of 50 acres of water frontage near and in Boston, extending along Neponset River, Dorchester Bay, and including a part of Squantum Point. The reason has not been stated, but it is supposed that a number of warehouses and wharves will be built for export trade.

NORFOLK & WESTERN.—Gross earnings for the five months ending Nov. 30 were \$8,390,019, as against \$7,311,463 last year, an increase of \$1,078,556. After deducting \$5,006,931 working expenses increased from \$4,166,992 last year, the net earnings were \$3,383,088, an increase of \$839,939.

PENNSYLVANIA.—The general coal situation on the Lines East of Pittsburgh and Erie is shown by the figures recently published for the year ending Dec. 27, 1902. During this period 2,274,083 short tons of anthracite coal originated on the lines, as against 4,562,237 during the year previous. Bituminous coal, however, increased from 19,486,276 in 1901, to 25,959,942 short tons, and coke increased from 8,018,508 to 9,588,180 short tons. The total short tons, therefore, aggregated 37,822,205 as against 32,067,021 during 1901.

A notice has been issued to stockholders asking for a large increase of capital stock and bonded indebtedness. The object is to provide for a sufficient working capital in the future; the Board of Directors to have power to issue this stock whenever it is deemed necessary. The present available surplus stock is only \$13,000,000. In 1873, under similar conditions, the stockholders authorized an increase in the capital stock to about double the outstanding amount. As it takes a majority vote of all the stockholders to increase the capital stock on bonded indebtedness, it is deemed wise that action shall be taken on both matters at the annual meeting on March 10.

SAN FRANCISCO, OAKLAND & SAN JOSE.—This company has authorized the creation of a bonded indebtedness of \$3,000,000 to build from Oakland to San Jose, and to organize a ferry system to San Francisco. The bonds are to pay 5 per cent. interest and are due in 1933. The directors of the company are F. M. Smith, W. H. Martin, W. F. Kelly and J. M. Chase, of Oakland, Cal.

SOUTHERN.—The gross earnings of this road for the five months ending Nov. 30 were \$17,788,125, showing an increase of \$1,822,643 over last year. The expenses and taxes were \$12,441,161 as against \$10,804,307 last year, an increase of \$1,636,854. Deducting the expenses of this year from the gross earnings, the net earnings were \$5,346,965, an increase of \$185,788 over the last five months of 1901.

STARK ELECTRIC.—A consolidation has been effected by the Alliance and the Stark Electric Companies, under the name of the latter. These two roads operate a combined total of about 35 miles, on the outskirts of Cleveland. C. R. Morely is President.

SUFFOLK & CAROLINA.—The capital of this company has been increased from \$400,000 to \$800,000 and a dividend of 100 per cent. declared. The road is owned by Baltimore capitalists, and runs from Suffolk, Va., to Edenton, N. C., 50 miles. Work is in progress on an extension to Elizabeth City. W. H. Bosley, of Baltimore, is President.

TIDEWATER & SUSQUEHANNA RIVER.—The consolidation of this company was noted in our Railroad News columns of last week under the heading of Susquehanna Tidewater; the correct name is as above.

VIRGINIA PASSENGER & POWER.—Control of this company, which is a consolidation of all the traction companies of Richmond, Va., and surrounding cities, has been acquired by Frank J. Gould. No plans have been given out, but it is probable that the company will continue without changing any of the present officers. (July 4, p. 544.)

WESTERN MARYLAND.—This company has filed a mortgage with the Bowling Green Trust Co., of New York, to secure an issue of \$10,000,000 general lien convertible mortgage 4 per cent. gold bonds due in 1952. This mortgage is subject to a prior mortgage securing an issue of \$50,000,000 in gold bonds.